AGRICULTURAL HISTORY

Volume 30 Number 1

January 1956

Herbert Anthony Kellar, 1887–1955 *Helen H. Edwards* 1

Dried Meat—Early Man's Travel Ration *Edward N. Wentworth* 2

Retardation in Farm Technology Before the Power Age *Earle D. Ross* 11

The Technological Revolution in Agriculture, 1910–1955 *William L. Cavert* 18

A Case Study of Urban Impact on Rural Society: Vermont, 1840–80 *T. D. Seymour Bassett* 28

The American Civil War: An Incentive to Western India's Experiments with Foreign Cotton Seeds? *Frenise A. Logan* 35

A Colonial Poem on Indigo Culture *Hennig Cohen* 41

Book Reviews 44

News Notes and Comments 48

Published Quarterly

by

THE AGRICULTURAL HISTORY SOCIETY

THE AGRICULTURAL HISTORY SOCIETY

Editorial Office

DEPARTMENT OF AGRICULTURAL ECONOMICS
UNIVERSITY OF WISCONSIN
MADISON 6, WISCONSIN

Officers and Executive Committee

President: George L. Anderson, University of Kansas, Lawrence, Kansas
Vice President: Vernon Carstensen, University of Wisconsin, Madison 6, Wisconsin
Secretary-Treasurer: Wayne D. Rasmussen, United States Department of Agriculture
Lewis E. Atherton, University of Missouri, Columbia, Missouri
Charles A. Burmeister, 4650 Broad Branch Road, N.W., Washington, D. C.
Albert V. House, Harpur College, State University of New York, Endicott, New York
Thomas H. LeDuc, Oberlin College, Oberlin, Ohio
Rodney C. Loehr, University of Minnesota, Minneapolis, Minnesota
Edward N. Wentworth, Route 1, Box 34, Chesterton, Indiana

AGRICULTURAL HISTORY

The Quarterly Journal of the Agricultural History Society

Agricultural History is designed as a medium for the publication of research and documents pertaining to the history of agriculture in all its phases and as a clearinghouse for information of interest and value to workers in the field. Materials on the history of agriculture in all countries are included, and also materials on institutions, organizations, and sciences which have been factors in agricultural development. The Society is not responsible for the statements or opinions of contributors. Editorial communications including manuscripts submitted for publication and books for review should be addressed to Vernon Carstensen, Editor, Department of Agricultural Economics, University of Wisconsin, Madison 6, Wisc.

All members of the Agricultural History Society receive *Agricultural History*. The memberships are: Student, $2.00; annual $5.00; contributing, $10.00; life, $133.00, inclusive of all previous payments of dues and contributions, or a sum in U. S. dollars equivalent to 133 less the age of the applicant at his or her last birthday, exclusive of prior dues and contributions; joint membership with the Economic History Association, $10.00; and joint membership with the Economic History Association and the Economic History Society (England), $13.00. Single current numbers, $1.50. Reprints, if available, 25 cents each. An annual subscription to *Agricultural History* is $5.00 net. Communicatinos regarding memberships, subscriptions, and other business matters should be addressed to Wayne D. Rasmussen, Secretary-Treasurer, Room 3905, S. Agr. Bldg., U. S. Agricultural Marketing Service, Washington 25, D. C.

Editorial Board

Editor: Vernon Carstensen, University of Wisconsin
Editorial Assistant: Phyllis R. Abbott
Lewis E. Atherton, University of Missouri, Columbia, Missouri
Rodney C. Loehr, University of Minnesota, Minneapolis 14, Minnesota
James H. Shideler, University of California, Davis, California
Lazar Volin, United States Department of Agriculture

Agricultural History is published for the Agricultural History Society at the Antes Printing Company, Evansville, Wisconsin.

Entered as second-class matter on October 12, 1928, at the post office of Baltimore, Maryland, under the Act of March 3, 1879. Re-entered July 20, 1955, at the post office at Evansville, Wisconsin.

Copyright, 1956, by the Agricultural History Society

HERBERT ANTHONY KELLAR,

1877–1955

HELEN H. EDWARDS

The sudden death of Herbert A. Kellar on October 8 brought sadness to his many friends in the Agricultural History Society. We will miss him for his genial and endearing friendship as well as for his singular contributions to the Society and to the history profession.

Herbert Kellar became a member of the Agricultural History Society in July 1919, only a few months after its founding in February. The history of the Society reflects the active part he played in formulating its program and aims. As Vice-President in 1921–1922, President in 1922–1924, and Secretary-Treasurer in 1924–1927, he energetically continued the work he had begun even before he was officially a member of the Society, when, in June 1919 he presented a report on a proposed national museum of the history of agriculture, one of the chief interests of the Society in its early days, and one that has continued ever since. Later, as a member of the committee to consider a national agricultural museum of the Agricultural History Conference at the Department of Agriculture (1939), he worked with Russell H. Anderson, chairman of the committee, and C. A. Browne to develop a plan for the establishment of a national museum and to prepare the report of the committee which was presented to the Conference. Again, in participating in the program of the National Agricultural Jefferson Bicentenary Committee, he gave an address on "Living Agricultural Museums," in which he presented in detail his ideas of a plan for a national agricultural museum, with branches conducting museum-farms throughout the country.

He was also active in planning a program for publication in the field of agricultural history by the Society and in making the arrangement with the American Historical Association to hold joint sessions and to publish papers on agricultural history in the annual report of the American Historical Association. The separates of papers so published from 1921 to 1925 as *Agricultural History Society Papers* are a prelude to *Agricultural History* which began publication in 1927. On January 21, 1925, Herbert Kellar presented a 9-page report on "Suggestions Concerning the Proposed Journal of the Agricultural History Society." He became an Associate Editor of the journal, of which Oscar C. Stine was the first editor, and remained on the Editorial Board until his death.

At each of the first two joint sessions which the Society held with the American Historical Association, Herbert Kellar read a paper: in 1919 on "Some Aspects of the Agricultural Revolution of the United States in the First Half of the Nineteenth Century," and in 1920, on "The Influence of the Agricultural Fair upon American Society, 1830–1851." In succeeding years he prepared other papers for the Society's meeting, but was particularly active in helping with planning the programs and meetings, suggesting participants from his wide acquaintanceship in the history profession and with research in the field, and in in serving as chairman or presiding officer, frequently pinch-hitting when the expected participant was not present.

When any crisis arose in the affairs of the Society, Herbert Kellar was always ready to lend his active, energetic support in solving the problems. Financial difficulties came to the fore from time to time. The Society has suffered from the common ailment of never having enough money for the work the members of the Society wanted to do. Herbert Kellar was one of the most active members in canvassing possibilities for more economical and satisfactory publication arrangements, in soliciting funds and members, and in seeking ways of increasing the income of the Society.

His interest in agricultural history, particularly machinery and milling, represented only a small section of Herbert Kellar's professional and intellectual interests which ranged over the whole field of American history, with emphasis on economic history, and included related subjects in the fields of historiography, library science, museums, and archives. Perhaps his chief contribution in these fields was as a planner, organizer, administrator, and mediator. As a member of

numerous committees and boards, he participated in determination of research needed and in large-scale planning for such research. His chairmanship of the National Advisory Committee of the Historical Records Survey of the Works Progress Administration is one example of such service.

Not least among his talents was his tact and understanding in his relations with people. The traditional parties with which he created a feeling of mellow fellowship and relaxed atmosphere for the exchange of ideas and views — and stories — among historians were enthusiastically appreciated and many men will cherish memories of good fun and exciting discussion. The parties were extremely important to Herbert and he determinedly persisted in giving them even when financing became an acute problem. He once explained that he had felt like a stranger and outsider at the first meetings he attended, and as he became acquainted and made friends in the history profession the memory of his uncomfortable experience made him determined to make newcomers to history meetings feel welcome and to help them get acquainted with their fellow historians.

Herbert Kellar was a humanitarian who never allowed his disagreement with another person to affect his appreciation of him as an individual. For his friends he had intense loyalty and affection. He was fortunate in having a wife whose personality and skills matched and complemented his. Lucile Kellar has contributed a great deal to the success of her husband's work. As a friend, Herbert Kellar leaves a place that cannot be filled; as a historian, his wise counsel and energetic industry will be sorely missed.

DRIED MEAT — EARLY MAN'S TRAVEL RATION

EDWARD N. WENTWORTH

Primitive man originated three methods of meat preservation—freezing, salting, and drying. Later on, according to the latitude, he developed further offshoots of each through refrigeration, spicing, and smoking. Some tribes which lived near salt springs, dead seas, or ocean flats discovered salt was a good preservative, while the subarctic tribes learned the efficacy of cold. Drying came from experience on the edges of the desert, or in mountain altitudes where the air was light and thin. When the atmosphere proved too humid for the sun and wind drying process, these methods were supplemented by fire, and the smoke from the wood or brush imparted distinctive flavors.

The discovery of drying as a method of preservation was just as natural as the other two types. Any meat left on a carcass by a predator or hunter would dry quickly in the regions where humanity first emerged from the anthropoid. Possibly this location was Asia or Africa; and most probably it was north of the Himalaya mountains. Perhaps the method of drying was worked out independently in several locations. Dried meat has been found in the ancient Sumerian sites, on the lower Egyptian Nile, and in the extreme northern and eastern edge of Mongolia. In a few cases, it can be determined definitely that the meat was dried before storing. Perhaps the first tradition in Europe was learned from the experiences of Genghis Kahn, Tamerlane, and other "Hun" invaders. In their first expedition, the Mongols ran short of the cattle they drove en route, but they apparently had enough dried meat in their haversacks to last until they could find additional food in the civilized settlements.

In the days before wheeled transportation, it was very important to carry meat in some form that would not spoil and yet could be conveniently carried by travelers on foot or horseback. Even before recorded history began, swarms of warriors and travelers were traversing the trade routes along the Mediterranean Sea—the famed "Course of Empire." Wild food animals disappeared rapidly, and farmers that dwelt along the highways could not raise enough cereals or domestic livestock to meet the needs of the villages already in the course of development. Ultimately, market centers grew up where pastoral tribes, hunters, and farmers, operating in areas lying off the trade routes, could bring their meats and grains for sale in a form the wayfarer could use. Jerky was a prime market product.

The practice of meat drying undoubtedly came to this continent by the great migration across the Bering Strait several millennia ago. It was the most convenient method of preserving meats, at a minimum weight, that the Asiatic tribes reaching North America then knew. No one can date the calendar for this event, but it was at least forty to sixty centuries ago. Possibly the method of desiccation with which this continent was acquainted had originated in several places but, because it was so uniform among all the primitive tribes in America, it seems likely that it sprang from one source.

In the western hemisphere, dehydration of meat was practiced all the way from the Arctic Circle to Patagonia. On the east coast of South America, numerous Brazilian and Paraguayan tribes, including those in the swamp areas, dried their seasonal meats over smoke. The Portugese explorers called this meat, *xarque;* the Spanish explorers, *char-qui;* and the English, *jerky.* In North America the term, *jerky,* was confined principally to the United States, with only a slight usage in Canada—probably adopted from the fur traders.[1] However, Charles J. Lovell calls attention to the fact that references to pemmican were in the literature of Canada as early as 1743 and 1777.[2] The Mexicans used still another word, *tasajo,* which may be nearer the original Indian sound, but now it cannot be identified.

In the fifteenth century, dried meats were known traditionally by the Celts in Wales, Ireland, and Scotland, as used by their warrior forebears eight or ten centuries earlier. The Basques in the Pyrenees, as well as the French races of old Provence, were familiar with the product during the ascendency of Rome. Earlier still, the ancient races of lake dwellers in the Balkans, Switzerland, and isolated regions of the Alpine mountain chains, left remnants of dried meats around their ancient dwellings that indicated their use of the product.

In his study of the American Indian, Clark Wissler divided the North American continent according to basic meats consumed.[3] Throughout the Arctic and sub-Arctic regions the chief dependence was placed on the flesh of the caribou, although in the northeast muskoxen were occasionally substituted. The salmon area extended as far south as San Francisco and eastward to the crest of the Sierras. The heart of the continent, however, depended on the bison, which even today contributes the best flavored jerky produced under conditions of sun and wind drying. In eastern Canada and New England, deer and moose, with an occasional elk, furnished the foundation; while along the Atlantic coast to the south, and in the Gulf region, deer and an infrequent bear, seemed most important.

The first historical reference to jerky in the western hemisphere was furnished by Castañeda, who prepared the records of the Coronado expedition (1540–1542). Two standard translations exist, the older being by George Parker Winship:

> They dry the flesh [of the bison] in the sun, cutting it thin like a leaf and, when dry, they grind it like meal to keep it, and make a seasoup of it to eat. A handful thrown into the pot swells up so as to increase very much. They season it with fat, which they always try to secure when they kill a cow [bison].[4]

The other standard translation, by Hammond and Rey, renders "seasoup" as "mash" and romanticizes the "pot" by calling it an "olla."[5] Some students have tried to assume that Castañeda referred to pemmican rather than jerky, because of his allusion to fat, but it seems rather obvious that he was discussing fat added during cooking or eating. Pemmican itself seldom required added fat to improve its appetite appeal, as it usually contained thirty-five to fifty per cent of fat before it was eaten, and on the northern plains it might include from sixty to eighty per cent.

The chief problem was to gather enough meat during the hunting season to warrant drying. Both the plains Indians and trappers

[1] V. Stefansson to author, February 16, 1955.

[2] Charles J. Lovell to author, February 16, 1955, quotes James Isham's *Observations on Hudson's Bay, 1743* (Toronto, 1949), 156, where it is called "Pimmegan," and the *Cumberland House Journal* of the Hudson's Bay Company, September 23, 1777, which lists 2924 pounds of beat meat, 1720 pounds of "Fatt," and 100 pounds of "Pimmacon." The first citation in print in England is in the Oxford Dictionary in 1801, from Alexander Mackenzie, the great Canadian explorer, and the first citation from an American source was from the Lewis and Clark expedition in 1804, though the dictionary purports to include words that first entered the English language in the United States.

[3] Clark Wissler, *The American Indian* (2d ed., New York, 1922), 2–3.

[4] George Parker Winship, *The Coronado Expedition, 1540–1542 (Fourteenth Annual Report of the Bureau of Ethnology,* Part I, Washington, 1896), 527–528.

[5] George P. Hammond and Agapito Rey, *Narratives of the Coronado Expedition, 1540–1542* (Albuquerque, 1940), 262.

relied on the bison, but the forest dwelling tribes also sought caribou, moose, and deer. Indian attempts to catch numbers of salmon during the seasonal runs have been well described by explorers and anthropologists. But not many are familiar with methods used by the tribal hunters of the Mississippi Valley before the horse age, who dwelt on the borders of the bison range. They hunted the bison afoot, a difficult and dangerous procedure.

Back in 1700 Nicholas Perrot, French commandant of the Northwest, described an even earlier buffalo hunt among the Illinois tribe.[6] Long before daylight a hunting party of young braves started out in three groups. One section went to the right, another to the left, and the third served as gap closers, dividing into two parts—able to support the right or left groups as they needed re-enforcement. The bison was more than a match for single hunters who approached on foot.

A long section or file was formed on each side and after traveling about a league toward the bedgrounds of the herd, some of the party remained to await daylight. After another league had been covered, a second party was detached, while the rest marched another half league and waited there. When the dew had dried, they closed the opening between the right and left groups and encircled the entire area, setting fire to the dried herbage. At this moment, the old men and boys from the tribal village joined them, and the completed fires on four sides surrounded the game. A few of the bison would try to break through the burning barriers, but the hunters could usually turn single animals back to their companions in the fiery enclosure. Perrot reports that sometimes a single village would secure as many as 1500 animals.

Bison killed during the summer when the animals were fat and their coats thin proved the best. The flesh was then of the finest quality and the pelts were easiest to remove and dress. The meat was cut along the muscle fibers (instead of across them) into as thin strips as stone knives would permit. Our American Indians were Stone Age men when Europeans first reached here; except for a limited number of tribes which had access to impure natural lead or copper ores. These metals were beaten into knives with hammers and then ground along the edges.

The flesh was dried as rapidly as possible in the sun and wind or, if too humid, in the smoke of the fire inside the lodge. This process actually mummified the meat and made it quite tough. Meat dry enough to last in damp warm climates was difficult to chew. Hence it was usually pounded into small fragments and placed in skin bags (christened by the French Canadians, *parfléches*) to make it convenient for travel or storage. Pulverizing was customarily accomplished by use of stone hammers, or wooden clubs against stone. Many fragments of rock were thus included in the "beat meat" or "pounded meat," as the fur trade came to call it. When fully dried, a buffalo cow was estimated to yield 45 pounds of dried meat which was quite a saving in weight in comparison with the original carcass.

The meat drying operation was a community and tribal affair. In 1843, Thomas J. Farnham reported quite vividly a picture of meatdrying by the Kaw tribe upon the Pawnee Fork of the Arkansas River in Kansas, near presentday Larned:

> Their wigwams were constructed of bushes inserted into the ground, twisted together at the top, and covered with the buffalo hides which they had been gathering for their winter lodges. Meat was drying in every direction. It had been cut into long narrow strips, wound around sticks standing upright in the ground, or laid over a rick of wicker work, under which slow fires are kept burning . . . . They make a yearly hunt to this region in the spring, lay in a large quantity of dried meat, return to their own territory in harvest time . . . and thus prepare for a long and merry winter. They take with them, on these hunting excursions, all the horses and mules belonging to the tribe, which can be spared from the labor of their fields upon the Konzas River, go south until they meet the buffalo, build their distant wigwams, and commence their labor. This is divided in the following way between the males, females, and children; the men kill the game; the women dress and dry the meat, and tan the hides . . . ; the younger shoots of the tribe during the day are engaged in watering and guarding the horses and mules that have been used in the hunt—changing their stakes from one spot to another of fresh grass, and crouching along the heights around the camp to notice the approach of foes and sound the alarm . . . . Unless driven from their game by the Pawnees, or some other tribe at enmity with them, they load every animal with meat and hides about the first of August, and commence the march back to their fields, fathers, and wigwams on the Konzas River.[7]

[6] Emma Helen Blair, ed., *The Indian Tribes of the Upper Mississippi Valley* (Cleveland, 1911), 121–122, contains translation of Nicholas Perrot's "Memoirs of the Manners, Customs and Religion of the Savages of North America," originally published by Jules Tailham, Leipzig and Paris, 1864.

[7] Thomas J. Farnham, *Travels in the Great Western Prairies* (2 vols., London, 1843), 1:63–67.

Not much has been written about *half-dry* meat. Stefansson states that this is the favorite form of preparation when the caribou are fat, over Canada from Lake Athabaska northward.[8] First the carcass is split down the back and the side is boned out. The choicest lean for making this preparation is taken from the hams and tenderloins. Some persons, principally traders, do not wish to have too much fat, so the excess is stripped off. Then the boneless side is hung like clothes on a wash line. A rawhide or other rope is used for suspension, or the meat may be spread over the branch of a tree. If the flesh is laid on the ground, it must be turned at frequent intervals. The intention is to have the meat dry on the outside, but on the inside it still retains considerable moisture. Where the sun strikes it, a sort of glaze is formed which is airtight, and the furtrader was very fond of the resultant flavor. Stefansson remarks that the outside "skin" protects it through the months of hot weather, and the half-dry meat is highly appetizing.

The usual method of cooking is to roast the sides by the fire, but the half-dry meat is also excellent if boiled. Since tooth decay is normally an affliction of starch, sugar, and cereal eaters, there was no trouble in chewing this meat among tribes north of the Mandan country. Of course, traders from England, France, New England, and eastern Canada, with teeth already decayed, did have some difficulty in chewing. However, the natives never faced that problem and Stefansson states that meals of good half-dry, boned caribou ribs, properly roasted, are the most delicious he has ever eaten.

During World War II the author was on the advisory staff of the Quartermaster General (with various explorers and geographers like Stefansson and Earl Parker Hansen), and had opportunity to learn several interesting criticisms of dehydrated meats. One of the first objections came from the members of our own committee, who felt that the meat did not "taste right." It was prepared at low temperatures and with a minimum of light and air. Sun drying permits the development of flavors arising from the natural enzymes in the meat, as well as from the crusting, or membrane, which appears on the outside during the drying process.

Some people, less practiced in the use of jerky and pemmican, complained that the sun-dried product had a "fishy flavor." Others expressed the opinion that the taste was due to the fats rather than to the proteins. Not much scientific research has been conducted on the relationships between the amino-acid composition of various proteins and their flavors. However, it is known that when the fats are completely removed, there seems to be little difference in taste between the flesh of various orders, genera, or species.

Sun drying required thin slices so as to obtain rapid removal of water under the hot sun and the circulation of dry air. There are two kinds of reactions in the proteins; one due to the enzymes natural in the meat and the other from enzymes of the micro-organisms. The action of the enzymes of the meat takes place normally, and produces the "aged" flavors to which we are accustomed. On the other hand, undesirable flavors may be developed by enzymes of organisms which act on amino-acids and their derivatives, converting them into highly odorous substances such as amines, mercaptans, and skatole.

This strong flavor in carelessly handled meats dried in the more humid regions provides one of the reasons why jerky has never found an important outlet in the civilized areas. In more recent times, a second cause of unpopularity was the time required in the home to soak and cook it before it was usable. During the early 1940's, an attempt was made to manufacture so-called "dehydrated meat," which was of very good quality, but on account of the war and the employment of so many homemakers in defense industries, it was not possible for them to obtain the time to rehydrate it and prepare it for the table.

With further reference to enzyme action, it should be noted that neither the naturally occurring enzymes found in the meat nor those caused by micro-organisms can act if the water content of the meat is reduced rapidly. When the percentage of water is dropped to 6 to 8, enzyme action is extremely slow and by the time it is reduced to 2 or 3 per cent, it is stopped. Thus dehydrated meat, during this period, as prepared for military and civilian personnel, had the water content carried down to 3 or 4 per cent as quickly as possible.

It proved very difficult to pulverize half-dry meat evenly for storage in the *parfêches* of the frontier, and flavor was often affected adversely when exposed granular fragments contained different water contents. Since the chief part of the off-flavors that come in the

[8] Stefansson to author, January 26, 1955.

proteins arise from outside action after the meat is ground, when it was dehydrated for wartime use, the temperature was raised to 165 to 170 degrees to "pasteurize" it. There are some enzymes in the flesh that, even at that temperature, may still be active, but the primary purpose is to destroy vegetative forms of life which act on the product through the elaboration of their own enzymes.

In the packing house, during World War II, the meat to be dehydrated was ground just as in hamburger or sausage. One of the large companies dried the product through a tunnel with a current of air passing over it, and another used a louver process. A third dried the ground meat in open pans and then transferred it to a vacuum. The latter process took care of the final drying, as well as any undesirable volatile products.[9]

The chief factor in developing the "fishy" taste in sun-dried jerky, to which inexperienced people objected, came from the fats. In sun and wind drying, unsaturated fatty acids tend to oxidize, producing substances which contribute to their distaste. Of the unsaturated fatty acids that produce unrelished flavors, the two most important are linoleic and linolenic (characteristic of linseed oil and very important in the skin health of mammals). The higher the temperature of the process, the more these oxidized fatty acids develop, and the more pronounced the "fishy" flavor.

To most people, a degree of "fishy" taste is not so bad. The rarer flavors of aged cheese and the epicurean delights of well-hung game, arise through similar aging, or proteolytic, conditions. However, during World War II, housewives were not accustomed to these flavors, so processes were used that held them in check. Also a small amount of salt (1 to 2 per cent) was added to increase the appeal to the average consumer. In spite of the most superior techniques, the dehydrated meat never became popular. In the military service, helicopters, airplanes, and parachutes made possible the delivery of canned meats, to which the military personnel in isolated posts was accustomed. At such posts as radar stations along and over the Himalayan hump, well within the enemy lines, delivery by air was almost regular.

An early discovery of prehistoric days was that dried meat was so difficult to swallow that it could not be eaten in a hurry, and dipping it in water made it even more tasteless than before. However, when the dried meat was dipped in melted fat, or even in oils that were liquid at ordinary temperatures, the ease of swallowing was greatly improved. Where the fats were too hard at normal temperatures, melting was often impossible during the chase or in the proximity of enemies, so the hunter or warrior introduced pieces of fat into his mouth at the same time that he bit off a chunk of jerky. This practice may have led to the manufacture of pemmican.

Hodge states that the word pemmican means more than the simple thought of fat, but also implies its manufacture.[10] He translates the Cree Indian word *pimiy*, as meaning "he makes grease." The Indians boiled the crude fat in water and skimmed off the supernatant oil. However, it may be going wide of the mark to derive the word pemmican from the Cree language.

Catlin and other early travelers report the collection and cracking of buffalo bones, which were broken and boiled to extract the marrow fat, which the tribes prized highly.[11] The marrow from the long bones, when cracked, could be easily extracted by physical methods, but the fat from the cell cavities at the end of the bones (or any other bones that had a spongy structure) was usually secured by crushing and boiling. Furthermore, Catlin states that the fat was put into buffalo bladders, which had been distended, for storage and later consumption. He says that marrow fat after cooling became quite hard "like tallow," and possessed the appearance and very nearly the flavor of richest yellow butter. A second motive in keeping the marrow fat separate was that it required more careful handling to prevent rancidity—it would not keep as well as ordinary tallow. At feasts, chunks of the marrow fat were cut off and placed in a tray or bowl with the jerky, so both could be eaten together. He suggests that this was a good substitute for bread and butter, and might even be considered the dietary equivalent of that ingredient for the tribesmen.

There was never enough marrow fat to

[9] Byron T. Shinn to author, February 18, 1955.

[10] Frederick W. Hodge, ed., *Handbook of the American Indian, North of Mexico* (Part II, Washington, 1912), 223.

[11] George Catlin, *The Manners, Customs, and Condition of the North American Indians* (London, 1841), 116.

make the amounts of pemmican which the Indians and frontiersmen required, so this type was known as *sweet* pemmican.[12] The ordinary pemmican was made by adding the fat from the hump of the bison, from under the skin, or from the body cavity. The latter was the hardest, and was preferred to the fat nearer the exterior of the body. Both caribou and buffalo pemmicans were formed by the addition of their own fats. Their range was treeless, and the natives had to hunt as fast as their quarry moved. Most of the time it was impossible to dry the meat and make the pemmican while the hunt was in progress, so the meat was stripped off the animals as fast as possible and cached each day. When enough was secured, it was dried, assembled, and the pemmican was manufactured.

In some cases, as a variant, wild cherries (pits and everything) were dried, pulverized, and mixed with the pounded meat. Thorn apples were also used, as well as June berries and choke cherries, and still farther north, sarvis berries. While these introduced special flavors, most of the trappers and explorers preferred the simple jerky and fat. However, in the winter camps some squaws were said to like more variety, and it was in part to satisfy the feminine tastes among Indians that berries were added. Also it may have been a white man's idea. Stefansson states that at the height of pemmican's use by whites around 1820, from 1 to 5 per cent of it was of the flavored or holiday sort (salt, raisins, dried berries, sugar, etc.), the cake variant of the "bread of the wilderness."[13] In many cases where the fruit pemmican was prepared for the men on long or difficult expeditions, the simple dried meat and fat type was prepared for the dogs used for transportation. After a few weeks' experience, almost without exception, the men exchanged their ration for the "dog pemmican," and the dogs got the "cake" variety.

For fish pemmican, salmon was dried and soaked in the northwest area and then pounded fine in stone mortars. These dried fish could be stored in baskets or fish fats could be added to make standard type pemmican.[14] In either case it was considered as an emergency food, since most of the tribes (especially those of the interior) preferred the product made from bison or deer meat. The sturgeon provided the principal fish oil, although in some cases seal fat was used.

The Eskimos did not produce jerky, although they were familiar with the Indian product south of them. Their substitute was known as *akutok* and was based on caribou meat, which was sliced thin and wind-dried until an outside crust was formed.[15] The inside, though, was merely half dry. The resultant meat did not grind satisfactorily to form jerky, as only an occasional piece was dry enough to be suitable. Consequently they chewed their meat instead of grinding it, and spat it out to be dried.[16] Before the coming of the fur traders along the north coast of the continent, most of the Eskimos became tobacco chewers. They obtained the largest part of their supply overland, although transportation through the southern Indian tribes was extremely hazardous. Also, a moderate amount was furnished by the Russians across the Bering Strait, despite the deviousness of the route. But *akutok* was not immersed in very hot fat, and wind drying, as a bactericide, could be only slightly as effective as sun drying, so both the tobacco flavor and organisms "lingered on."

In the old days when pemmican was being manufactured, it was poured into the bag, and watch was kept to flatten the sides to a thickness of 6 to 7 inches—thereby giving it more of a brick shape when it was cooled. This aided in stacking and storing it, and in general made it convenient to handle. Gradually these bags were standardized for the fur trade at about the size of an old fashioned bed pillow, and would weigh, when filled, from 80 to 90 pounds. In this form the bags were known as "pieces of pemmican." Each bag was of buffalo rawhide, the hair side being out. When filled, the mouth was sewed shut and all of the seams were greased with fat, which was applied when cool enough to congeal. This excluded air from the contents and if a canoe was upset, for example, it prevented water from reaching the interior.

The French fur traders and trappers, as stated previously, christened these rawhide bags *parflêches*, and specified slightly different shapes. They required that they be

[12] Hodge, *Handbook of the American Indian*, 223, 224.
[13] Vilhjalmur Stefansson, *Not By Bread Alone* (New York, 1946), 182.
[14] Wissler, *The American Indian*, 9.
[15] Stefansson to author, February 16, 1955; *Not By Bread Alone*, 37n.
[16] Hodge, *Handbook of the American Indian*, 223, 224.

roughly cylindrical and taper toward the bottom. Usually they were fringed on one side, and were used for storage rather than for shipment.[17]

Around the turn of the 20th century the rawhide bags were also called *taureaux* (bulls). Alexander Henry reported receiving in the Red River country of Dakota four *taureaux* of pemmican per canoe, each load weighing over 300 pounds. These *taureaux* were also rawhide bags, whose contents totalled about 80 pounds. Sometimes the name *taureaux* was transferred to the same amount of pemmican when it was packed differently. The best quality of pemmican came from the upper Red River in Dakota, and when circumstances prevented Henry from getting other food he wrote:

> We now were obliged to eat pemmican, and had a few bags which had been lying all summer in a heap covered with a leathern tent. I was apprehensive that it was spoiled from the complaints made by my friends about the bad quality of Lower Red River pemmican, but was surprised to find every bag excellent. This was clear proof to me that the bad pemmican [of which they spoke] came from another quarter—I suspect Portage-la-Prairie [west of modern Winnipeg and not on the Red River].[18]

Pemmican was a summer food, used in hot weather by Indians, traders, trappers, and explorers. Contrary to usual modern dietitians' teachings, the percentage of fat desired was as high in summer as in winter. A convenient method of figuring the proportion of fat is by the calories furnished by it in proportion to the calories coming from the lean. Most Americans tasting pemmican for the first time prefer 50-50, or at most 60-40. But for the hard working *coureurs-des-bois* 70-30 was too small, and 80-20 was preferred. When Earl Parker Hansen, the tropical explorer, went to Liberia a few years ago, Armour and Company manufactured both 70-30 and 80-20 varieties for him, but in a few days he came to the conclusion that only the latter suited his needs. Similarly, for cold climates, R. E. Priestley favored an even higher proportion, 60 per cent of fat by weight, which probably provided more than 90 per cent of the calories.[19]

The problem of bulk was another question leading the way from jerky to pemmican. The original strips of dried meat were never flat enough to pack well and the "beat meat" was too fluffy. When ready for manufacture into pemmican, the bag, bladder, or other membrane receptacle, was filled loosely (like feathers in a pillow), and melted tallow, about the temperature of lard for frying doughnuts (365°F), was poured into the container.[20]

An excellent illustration of the importance of this reduced bulk occurred during the Gold Rush in California. The hordes of prospectors soon exhausted the game supply, the surplus from the Mexican and Spanish owned ranches, and the animals that could be driven from nearby territories like New Mexico and the Midwest. So important amounts of Oregon jerky and pemmican (especially the former) were shipped by vessel to San Francisco or transported by pack animals to the northern California regions.

The food value of pemmican is surprising. Considered from the standpoint of calories the maximum of energy that can be crammed into a pound of digestible food is around 4000 to 4200 calories—the amount in a pound of pure lard.[21] Pemmican often yielded 3200 to 3500 calories, depending on the ratio of fat. Three quarters of a pound of pemmican was needed for the day's ration, although the hard working *coureurs-des-bois* of the fur brigade often consumed a pound and a half to two pounds, when making long portages.

These French Canadians (especially those working for the Hudson's Bay Company) carried their pemmican by the "piece." Since a piece of pemmican varied from 80–90 pounds in weight, the Hudson's Bay porters carried one, two, or three "pieces"— 80–90, 160–180, or 240–270 pounds. In addition, they were "allowed" to carry anything like their own equipment, such as their blankets, hatchet, pipe, tobacco, mosquito net, spare clothes, and even a present for the wife.[22]

[17] Robert H. Lowie, *The Crow Indians* (New York, 1935), 79.

[18] Elliott Coues, *The Red River of the North (New Lights on the Early History of the Greater Northwest. The Manuscript Journals of Alexander Henry and of David Thompson*, vol. 1, New York, 1897), 276.

[19] Raymond E. Priestley, *Antarctic Adventure* (New York, 1915), 344.

[20] V. Stefansson, "Pemmican," *Activities Report —Research and Development Associates* (Food and Container Institute, Inc., New Series), 3:243–244n (1951). His principal work on pemmican is in *Not By Bread Alone*, 185–187.

[21] Shinn to author, February 18, 1955.

[22] Stefansson to author, February 16, 1955.

"Three-piece" men were rare, famous from Edmonton to the Arctic Ocean, and well nigh Dominion heroes.

One of the fears expressed about a pemmican diet arose at the beginning of World War II, when the military and naval physicians worried about the development of ketosis in the average soldier or sailor—especially if he received only a fat and protein diet without carbohydrates to serve as a source of quickly available glycogen (animal sugar as it exists in the blood). When the available supply of glycogen gets low, one undergoes a form of nerve poisoning by the ketones, which are one of the products of fat metabolism and which are very active chemically since they characteristically have only an atom of oxygen to one of carbon and are really "predatory" on the nervous system. Peary, and other Arctic explorers, offset this by using a supplement of ship's biscuit, but the hard-working trappers and voyageurs seemed to have grown into adjustment to the high-fat low-carbohydrate diet as a matter of long conditioning.

While some military subjects on an experimental pemmican diet during World War II developed the odor of ketones on their breath, apparently the only ones who believed themselves seriously affected were those who had been informed of such a possibility in advance.[23] Ketosis, in the extreme, is what causes athletes to collapse at the end of a strenuous race, but it is quickly overcome by the introduction of glucose into the circulation. Under ordinary military conditions, where one would choose in an emergency between the consumption of pemmican or starvation, pemmican seems to be far the more intelligent selection. Men accustomed to eating it would scarcely exchange such food for anything else, as noted later.

A second worry arose over scurvy. This last disease is caused by a deficiency of vitamin C in the diet. Nearly a century ago it threatened winter life on the frontier, and was not a disease expected solely at sea or in the barren north. Colonel Philippe Regis de Trobriand struggled against it among his troops in Dakota in the winter of 1867–68. He begged for cattle for fresh meat as early in the fall as September for, he said, "some cases of scurvy have already broken out in the garrison as a result of using salted meat and being without vegetables too long."[24] Many times authorities believed that scurvy was caused by lack of exercise and by filth, but by March, de Trobriand was convinced that it was something lacking in the food. He blamed the "limitation of fare which, because of the absence of fresh vegetables, eggs, fowl, veal, mutton, and even game, had reduced us to a diet that brings scurvy to the soldiers and takes the edge off the appetites of the officers."[25]

Meat may lack the concentrations of vitamin C to bring instant therapeutic response, but by de Trobriand's time commanders in the field knew that it would bring early relief, and when used in advance would prevent the appearance of the disease. A half century later, Dr. Alfred Hess presented a paper on scurvy before the American Medical Association in New York.[26] He stated that he used fresh lemons, limes, grated oranges, and grated raw vegetables, but on meat alone Stefansson obtained the same results. Both diets required four days for recovery. Furthermore, they were found to be equally quick in cases of scurvy when the patients were gloomy in spirit, too weak to stand, and had pain in every joint.

Another decade was required after de Trobriand to give proper credit to pemmican on these points. A serious outbreak of scurvy took place among the members of the Arctic expedition of Sir George Nares in 1875–76 and a committee was appointed by the British admiralty to conduct his court-martial. The most effective witness was Rear Admiral Sir Leopold McClintock, who had been the outstanding personage to emerge from the numerous searches for the lost Sir John Franklin expedition of the latter 1840's.[27] He testified that he used lime juice (the standard remedy of that date) on only one expedition, and that whenever he could use fresh meat—and he stated emphatically that he considered the

[23] Interview of Col. E. C. Mattick by author, January 28, 1942.

[24] Phillipe St. Regis de Trobriand, *Military Life in Dakota*, edited by Lucile M. Kane (St. Paul, 1951), 71.

[25] *Ibid.*, 238.

[26] Stefansson quotes Hess in *Not By Bread Alone*, 171.

[27] Report of the Committee Appointed by the Lords Commissioners of the Admiralty to Enquire into the Causes of the Outbreak of Scurvy in the Recent Arctic Expedition — presented to both Houses of Parliament — London, 1877. Admiral McClintock's testimony was given January 20, 1877, on 110ff, questions on pp. 3248–3399.

dried meat in pemmican equally as efficient as fresh—he had no trouble with scurvy.

During World War II some authorities objected to the assumed high percentage of protein in pemmican, and recommended carbohydrates. Protein requires more water in human metabolism than starches and sugars. In fact the water requirement is more than seven times as great in protein. But starches and sugars cannot rebuild the muscular tissue and human vigor declines, while the energy-releasing foods accumulate uselessly because the human machine is running down. The fat in pemmican is particularly important in this connection for it releases relatively large amounts of water, about 1.1 grams of metabolic water to each gram of fat. Popular knowledge of this phenomenon comes from the fat of the camel's hump, the water tank of the "ship of the desert." Hence, plane crews bailed out on the arid plains, or sailors cast out in a life boat can live much longer on pemican because the fat conserves the body water and the protein rebuilds the body tissue. If lost for a short time carbohydrates are satisfactory, but if the time is longer protein must be in the ration for survival. If one has room enough for starchy products there is a slightly greater amount of metabolic water formed per calorie of energy from starch than is formed per calorie of energy from fat. However, the difference is very small, and the fat and protein combination is a much more compact unit of energy than is the starch and protein combination.[28]

Pemmican was not planned to be a regular food supplanting all others; but was really an explorer's, adventurer's, or traveler's ration. It was intended for hungry men, not for epicures, gourmets, or connoisseurs. The remarkable thing about it was that it could be used so long, be completely nutritive, and still appeal to the man using it. It creates no appetite when first placed in the mouth, but the longer it stays, the better it tastes, and the longer one eats it the more he appreciates it. After living on it for months at a time, on several polar trips, Admiral Peary wrote:

> It is the most satisfying food that I know. I recall innumerable marches in bitter temperatures when men and dogs had worked to the limit and I reached the place for camp feeling as if I could eat my weight of anything. When the pemmican ration was dealt out, and I saw my little half-pound lump, about as large as the bottom third of an ordinary drinking glass, I have often felt a sullen rage that life should contain such situations. By the time I had finished the last morsel, I would not have walked around the completed igloo for anything or everything that the St. Regis, the Blackstone, or the Palace Hotel could have put before me.[29]

In a similar vein Raymond R. Priestley, who was a member of the scientific staff of the first Shackleton Expedition, 1907–09, and the second Scott Expedition, 1910–13, is equally full of praise:

> Under ordinary circumstances, when one first starts on a journey, one's full allowance is seldom eaten, but, as time passes and the work and the keen air take effect, one becomes hungrier and hungrier, until the sledging allowance of pemmican is not sufficient to satisfy the cravings aroused. It is then that pemmican is truly appreciated at its full worth. Nothing else is comparable with it. I have taken all sorts of delicacies on short trips when the food allowance is elastic, I have picked up similar delicacies at depots along the line of march, and I have even taken a small plum-pudding or a piece of wedding-cake for a Christmas treat, but on every such occasion I would willingly have given either of these luxuries for half its weight of the regulation pemmican.[30]

Stefansson caps it all by writing:

> Pemmican . . . has been found to continue tasting good to those with good appetites, even when no food but pemmican has been used for weeks on end . . . . So it is about pemmican as the Scots are said to remark about whisky—there is no bad pemmican, but some are better than others.[31]

That this statement applies to a man with his heart in his work rather than to one with play in his heart is obvious, but which man of the two converted our "wide-open spaces" into our modern economic scene?

[28] Shinn to author, February 18, 1955.

[29] Admiral Robert E. Peary, *The Secrets of Polar Travel* (New York, 1917), 77–79.

[30] Priestley, *Antarctic Adventure*, 344.

[31] Stefansson, "Pemmican," 251.

RETARDATION IN FARM TECHNOLOGY BEFORE THE POWER AGE*

EARLE D. ROSS

Iowa State College

The most cursory survey of technological progression in any area reveals that the degree and rate of advance have been highly relative and gradual. Such an established fact makes the conventional succession of "revolutions" in the textbooks, however convenient for instructional emphasis, peculiarly unhistorical. In particular, the faithful recorder of the unsteady trace of the cultivator and husbandman from barbarism to the recent past, at least, has to be content with humble changes within long eras and to settle for relatively small achievements from one stage to the next. Thus Gray's weary plowman rose a notch in technical efficiency as well as in status above Burns' cotter with his crude hand tools. The pioneer dean of agricultural teaching, I. P. Roberts, maintained that the cradle, as compared with all previous reaping implements, was a more significant invention than all the later harvesting machines, and the veteran dean of farmers' institutes, J. S. Woodward, was convinced that the flop-over hay rake was the greatest laborsaving device of his prime.[1]

In rural living, the old lady of the utility pictogram might well, in retrospect, marvel at running water in the kitchen and wonder what they would think of next. No less understandably, a typical cornbelt community, as late as the early years of the present century, could feel an assured modernity with a split-log King road drag, daily mail, and neighborhood telephone.[2] With the lingering survivals of pioneer ways, East and West, the "then and now" contrasts provided themes of unfailing interest in rural journals, and addresses at farmers' institutes and state and local fairs.[3]

Such background considerations, it would seem, should be moderating in this age of automation, miracle syntheses, power unlimited, and projected spatial navigation—when even, to cite an extreme example, a beneficent robot has freed the college instructor from the dispiriting grind of evaluating tests and his students from the distracting inconvenience of thinking about them.

Rather than being abrupt or catastrophic, as suggested by the term "revolution," the transitions have been delayed, halting, hesitant, as well as uneven between regions and even, at times, adjoining farms. Basic natural limitations kept the farm at a disparity with the expanding factory. The essential conditions of mechanized fabrication, standardized production, and adequate economical power, were available for the farm only to a limited, slowly increasing degree in the case of the former and long delayed for the latter. Hence Carver's sweeping generalization that "Beginning with 1833, there occurred on American soil during the next thirty years one of the most remarkable agricultural transformations ever known in the history of the world,"[4] would be more nearly accurate, though much less striking, if stated that in these years changes were under way which would work out gradually in a partially mechanized and commercialized economy.

Stony hillsides with lingering stumps in many areas as well as traditional inhibitions delayed mechanization in the East. In contrast, the settlement of the prairies, along with the growth of markets and the extension of transportation, created an increasing pressure for mechanizing cultivation and harvesting.

From the 1830's to the 1860's inventive genius was stirring at every crossroad. Blacksmiths became mechanics, skilled mechanics and many with a smattering of science or mere visionaries were seeking to apply their theories or fancies. So numerous and varied

*This paper was presented at the joint session of Agricultural History Society with the Mississippi Valley Historical Association in St. Louis, April 29, 1955.

[1] Jared Van Wagenen, *Golden Age of Homespun* (Ithaca, New York, 1953), 226, 236.

[2] Arthur Pickford, *Westward to Iowa* (Mason City, Iowa, 1940), 87.

[3] For early examples of such comparisons, see New York State Agricultural Society, *Transactions*, 4:34–42 (1844); 16:188–194 (1856).

[4] Thomas N. Carver, *Principles of Rural Economics* (Boston, 1911), 84.

were the contributors and so long was the time from patenting to practical application that the true inventor is in most cases impossible to determine. Frequently credit has gone to a mechanic who had the ingenuity to combine and integrate the ideas of others, or even to an early promoter who had the foresight and capital to engross basic patents.[5]

In the formative years, before capital demands, patent litigations, and price wars forced the weaker firms from the running, the industries were widely decentralized in custom foundries and small factories. As in the early days of the automobile, every ambitious town had some sort of establishment to turn out the particular model of the local genius although many did not go beyond a few machines or implements for local trial.[6]

In the stage of cutthroat competition following the Civil War, there ensued a long and costly struggle involving high pressure salesmanship with unscrupulous misrepresentation, price cutting, open and secret, excessive and abusive advertising, long court battles, and ineffective pooling agreements. From this attritive contest, the fittest financed and managed concerns survived, and like other similar competitors eventually combined into a few large holding companies. If there was any sort of revolution in the coming of farm machinery, it was entrepreneurial rather than mechanical.

The earliest of power driven implements, the plow, went through an extended series of piecemeal betterments and adaptations until by the 1870's the modern forms and types had appeared, but still with many refinements of materials and adjustment of parts to be added. By this time, harrows, rollers, drills, planters, and cultivators were improving and speeding the processes of tillage.[7]

However, the main inventive and promotive genius for a half century from the middle 1830's centered on machines to relieve and hasten the exhausting and highly seasonable labor of harvesting and threshing. Such mechanical precision and acceleration was imperative for large-scale grain production. But early models, it must be recognized, were so sensitive to terrain, so particular in stand of plant, so dependent upon supplemental hand servicing, and so liable to interruption for adjustments and repairs that they were "laborsaving" only to a limited extent.[8]

Each essential feature of the reaping and mowing machines, combined or separate, was the subject of prolonged trial and error by many minds and hands in as many workshops. The relative performance of the numerous rivals was demonstrated in competitive trials, at home and abroad, that came to have the interest of a horse race or of the later century runs of bicycles and cross-country endurance races of automobiles. Without uniform standards of judging and with no little jockeying

[5] The most complete and objective biography of an inventor-promoter in this realm is William T. Hutchinson, *Cyrus Hall McCormick: Seed Time, 1809–1856* (New York, 1930), and *Cyrus Hall McCormick: Harvest, 1856–1884* (New York, 1935). An uncritical, poorly organized brief for the leading rival of McCormick is Follett L. Greeno, *Obed Hussey, Who of all Inventors, Made Bread Cheap* (n.p., Author, 1912). Lesser pioneers are dealt with in Ellwood Hendrick, *Lewis Miller: A Biographical Sketch* (New York, 1925) and Lloyd Lewis, *John S. Wright: Prophet of the Prairie* (Chicago, 1941).

[6] Jesse Buel, *The Farmers' Instructer* (2 vols., New York, 1854), 2:10–11; Ulysses P. Hedrick, *History of Agriculture in the State of New York* (Albany, 1933), 290–293; *Prairie Farmer Annual*, 1869, 1871, for advertisements of farm equipment; Hubert G. Schmidt, *Rural Hunterdon* (New Brunswick, 1945), 102–105.

[7] Herbert A. Kellar, ed., *Solon Robinson: Pioneer and Agriculturist* (2 vols., Indianapolis, 1936), 1:120–121, 287–288, 309, 476–477, 530–533; 2:24, 28–29; Jesse Buel, *Farmers' Companion* (Boston, 1842), Chap. 14; David A. Wells, *The Year Book of Agriculture* (Philadelphia, 1856), 82–105; U. S. Commissioner of Agriculture, *Report*, 1862, pp. 413–420; George E. Waring, *Book of the Farm* (Philadelphia, 1877), Chaps. 6–7.

[8] Analytical discussions of various aspects of the development and utilization of farm machinery are given by Hadley W. Quaintance, *The Influence of Farm Machinery on Production and Labor* (New York, 1904); and Leo Rogin, *The Introduction of Farm Machinery in Its Relation to the Production of Agriculture in the Nineteenth Century* (Berkeley, California, 1931). The successive stages in mechanization are shown most realistically in carefully selected pictorial collections. See especially, James T. Adams, ed., *Album of American History* (5 vols., New York, 1944–1949), index under "farm implements"; Ralph H. Gabriel, *Toilers of Land and Sea* (New Haven, 1926); Mitchell Wilson, *Science and Invention: A Pictorial History* (New York, 1954), 136–143, 235–241; Liberty H. Bailey, ed., *Cyclopedia of American Agriculture* (4 vols., New York, 1907–1909), 1:202–231; Robert L. Ardrey, *American Agricultural Implements* (Chicago, 1894); Merritt F. Miller, "Evolution of Reaping Machines," U. S. Department of Agriculture, Office of Experiment Stations, *Bulletin* No. 103 (Washington, 1902); C. J. Zintheo, "Corn-Harvesting Machinery," *ibid.*, No. 173 (Washington, 1907).

of machines and horses, the results were most inconclusive.[9]

After the various operations of beating and winnowing grain had been separately mechanized, the operations were combined in a single thresher, separator, and cleaner. By the 1850's, such a substitution for primitive tramping, flailing, and blowing was being performed with varying degrees of completeness and economy.[10] In fact in every area of farm equipment, this qualification of incompleteness and imperfection had to be made as the nation entered upon the task of production for the most demanding war to that time.

In spite of the assured prediction by the superintendent of the Eighth Census that the man with the hoe, the cradle, and the flail was definitely passing from the rural scene,[11] the developments that during the past decade had brought the factory system to a dominant position in manufacturing were by no means paralleled on the farm. The statistics of increase, starting from scratch, were indeed impressive, but the inadequacy of processes, the very unequal regional distribution, and the small percentage of farms supplied, put serious limitations on the seeming advance. Number of patents was too often confused with practical operation.

The extent of the use of machinery in the Civil War has been exaggerated. There was an appreciable increase in the Middle West but not to the extent of that in the immediate postwar years. Harvesting machinery was not utilized to any extent in the East before the '70's. The South was unable, for war needs, to overcome a notable backwardness in machinery.[12] And at most, available machines had only limited possibilities in labor substitution. The reaper with dependable self-rake and with operator transferred from horseback to driver's seat was not to be had before 1870. The twine binder was delayed a decade longer. "In self-binding reapers," Jonathan Periam gave assurance in 1878, "their perfection by human means may be said to have been about reached."[13] Human means continued to be applied to this as to other machines and implements. But in a survey of agricultural "progress" in 1899, much still remained to be added and perfected.[14] With the tradition of exploitive cultivation, more emphasis was given to size as in gang plows, wider harvesters, crude headers and combines, and big threshers than to improvement and refinement in performance.

Regional distribution remained uneven. The Midwest, which had led in introduction, continued to be the center of production and use. The Great Plains and the Pacific slope ventured in large, heavy equipment in cultivation and harvesting—gang plows, headers, and combines. The East was slower in mechanizing and generally preferred the lighter and simpler models. The South, notoriously restricted in equipment in plantation days, with a few exceptions like rice production, failed to maintain large-scale units by mechanization in the postwar readjustment. The fervent exhortation of an enthusiast for steam power, in 1874, was unheeded:

> To the planters of the South who are working under the great cloud of a sparse and disorganised labor, we say here is the grand solution of your problem. Wait not for the advent of the immigrant and the 'heathen Chine,' worshiping false gods, but with the Christian labor around you, harness the mighty power of steam to the Car of Ceres and command success.[15]

[9] Wells, *Year-Book*, 11, 110–118; U. S. Agricultural Society, *Journal*, 1857, pp. 123–234; Hutchinson, *Cyrus Hall McCormick: Seedtime*, 342–344, 381–403; Lewis, *John S. Wright*, 186. In 1834, Jesse Buel proposed that a New York state board be appointed to examine and test all implements and machines offered for sale and to publish the findings, *Farmers' Instructer*, 2:11.

[10] Joseph G. Kennedy, *Preliminary Report of the Eighth Census, 1860* (37 Cong., 2 sess., House Executive Document No. 116, Washington, 1862), 90–100; Van Wagenen, *Golden Age*, 246–247; Schmidt, *Rural Hunterdon*, 107–108.

[11] Kennedy, *Preliminary Report of the Eighth Census*, 80–82.

[12] U. S. Census Office, 8th Census, 1860, *Agriculture of the United States in 1860*, x–xxix; John A. T. Hull, compiler, *Census of Iowa for 1880, and the Same Compared with the Findings of Other States* (Des Moines, Iowa, 1883), 141; Iowa State Agricultural Society, *Report*, 1865, p. 7; *ibid.*, 1867, pp. 213–267; S. T. K. Prime, compiler, *The Model Farms and Their Methods* (Chicago, 1880), 500, 555. Van Wagenen, *Golden Age*, 227; Isaac P. Roberts, *Autobiography of a Farm Boy* (Albany, 1916), 189; Willard Range, *A Century of Georgia Agriculture* (Athens, Georgia, 1954), 20, 56; Ardrey, *Agricultural Implements*, 114. On the writer's family farm in southern New York four miles from a trunk line railroad, the first moving machine was secured in 1867. It was also the first to be brought into the community. The second machine to be used on this farm (a Cayuga chief) was still in existence, though no longer in operation, in the early 1890's.

[13] Jonathan Periam, ed., *The American Encyclopaedia of Agriculture* (Chicago, 1881), 785.

[14] U. S. Department of Agriculture, *Yearbook*, 1899, pp. 314–320.

[15] U. S. Commissioner of Agriculture, *Report*, 1874, p. 283; Range, *Georgia Agriculture*, 80–83.

Down to the recent advent of the mechanical picker, cotton was to remain the last stronghold of hand labor.

In all regions, but especially in the Northeast, there was a lingering emphasis, down to the first decade of the 1900's, upon the perfection in adaptability and the skill in using hand tools. Major industries, localized in New England, were devoted to the fabrications. At the New York state fair in 1851, the management, as a mark of respect, presented Solon Robinson, in addition to a landside plow, with "one of the most elegant pitchforks that ever I saw, and which has been universally admired by thousands who have seen it . . . ."[16] Throughout the century, advisers of the farmer justified hand processes for certain conditions. Earlier threshers were wasteful and uneconomical for the small producer. For the preservation of the straw, especially rye for which there was a commercial demand, flailing remained the approved method. The cradle continued to be standard for cutting oats and buckwheat on sidehills as well as for clearing a broad passage around the field for the drop reaper or harvester.[17]

The manual labor requirement in agricultural colleges to the 1880's indicated a continuing regard for hand skills. Very general principles and applications began to be taught only in the middle '90's by professors of mechanical engineering.[18] In spite of the salesman's sordid tale of the back-breaking drudgery from which the machine would free the worker, there was with the average farm boy and hired man a pride in manual skill which long had an urge comparable to athletic contests.[19]

The persistence of hand implements was encouraged by the complexities and imperfections of earlier machines. Francis A. Walker was confident, in 1880, that nine tenths of American farmers had the mechanical skill to operate all available machines. The correspondence of agents and other recorded observations show the statistician's lack of understanding of actual farming.[20]

Even more the simpler equipment was preferred for reasons of economy by proprietors and tenants with limited capital funds. In spite of exhortations by farm papers to buy only the best and most efficient machines, the cheapest and most indispensable were usually secured. On smaller farms, even in the period of general laborsaving equipment, such specialties as tedders, side-delivery rakes, hay loaders, and manure spreaders were felt to be for the larger, wealthier operators. As simple a device as a hay fork was common but by no means universal.

The cost of standard equipment for a medium-size general farm down to a half century ago remained extremely modest in comparison with later requirements. In 1862, an estimate for the "principal implements and machines" of a farm of 150 acres of "mixed husbandry," including a threshing machine and platform scales, totaled $968.00,[21] and as late as 1907, a professor of farm mechanics estimated the cost of the essential equipment of a grain and stock farm of 160 acres at only $785.00.[22] Even so his list included several items that were lacking on the average eastern farm.

Whatever the mechanical limitations in the larger operations, there remained in the prepower age important branches of the occupation that enjoyed no substantial mechanical relief. Dairying was still dependent upon hand skill and artistry in the demanding milking operation. Testing, separating, cooling, and general servicing were all performed on the farm by hand utilities.[23] The poultry industry from propagation to marketing had few mechanical aids.[24] Horticulture was limited in size and improvement by hand tools

[16] Kellar, *Solon Robinson*, 1:307.

[17] Richard L. Allen, *American Farm Book* (New York, 1849), 135; Van Wagenen, *Golden Age*, 223–227, 234–235, 241–242; Carl E. Ladd and Edward R. Eastman, *Growing Up in the Horse and Buggy Days* (New York, 1943), 31–32, 41, 52–54, 57, 185–190, 196–200; Miller, "Evolution of Reaping Machines," 11.

[18] Association of American Agricultural Colleges and Experiment Stations, *Proceedings*, 1894, pp. 71–74.

[19] Van Wagenen, *Golden Age*, 227–230, 235; Ladd and Eastman, *Horse and Buggy Days*, 57; Edward R. Eastman, *These Changing Times* (New York, 1927), 37.

[20] U. S. Census Office, 10th Census, 1880, Vol. 3, *Productions of Agriculture*, xxix–xxx; Quaintance, *Farm Machinery*, 7–8.

[21] U. S. Commissioner of Agriculture, *Report*, 1862, pp. 422–423.

[22] Bailey, *Cyclopedia of American Agriculture*, 1:216.

[23] *Ibid.*, 3:309–313; U. S. Commissioner of Agriculture, *Report*, 1870, p. 394; Periam, *Encyclopedia of Agriculture*, 653–654; Eastman, *Changing Times*, 35–36; U. S. Department of Agriculture, *Yearbook*, 1899, pp. 381–402.

[24] Bailey, *Cyclopedia of American Agriculture*, 1:183–187; 3:525–587.

and appliances, and market gardening had at best small, one-horse replicas of the larger machines.[25]

Highways, worked by dwellers along the neighborhood "beats," were given crude grading and leveling by a horse scraper and smoothing drag. Subject to the uncontrolled natural hazards of drifting, flooding, freezing, and thawing, they were most undependable "farm to market roads."[26] Conveyance of produce and people was by lumber wagon, bob sleigh, platform wagon, buckboard, top buggy, "pleasure sleigh" or cutter, and covered surrey with or without fringe.

Households functioned and operated wholly without benefit of mechanized utilities and conveniences. Where funds were available, houses were built and equipped for amplitude and ornateness rather than for comfort, sanitation, and economy in physical exertion.[27]

But with all these limitations, mechanical applications were well in advance of those in chemistry, biology, and genetics. President T. C. Abbott, in addressing the Michigan legislature in 1874 in behalf of the Agricultural College, stressed this disparity:

> One department of agriculture alone advances with the progress of science—its machinery; this is because it is less a part of agriculture proper than of mechanics, whose principles are known.[28]

In spite of the pioneer work of such agricultural scientists as Norton, Porter, Pugh, S. W. Johnson, and Brewer, who were in touch with the findings of German, English, and Scotch research, there were many basic principles in dispute and uncertainty.[29] The doubts and differences were at times given disheartening emphasis especially by administrators and journalists. In reporting, in 1847, the devastating ravages of the potato blight in Europe and America, the commissioner of patents concluded fatalistically that "when and where its destructive course shall be stayed belongs not to human wisdom or human effort to determine."[30] A few years later in comparing "the position and prospects of American agriculture" to a journey from Albany to Buffalo, Professor John A. Nash suggested that it would "approximate the truth" to say the farmers were approaching Utica.[31] Greeley, in his books on agriculture and political economy and in addresses before regional and state fairs and the American Institute, was characteristically outspoken in depicting the backwardness of the nation's basic industry.[32] The notable gathering of American agriculturists at the Yale Agricultural Lectures in 1860 was probably of most permanent significance in demonstrating the continuing limitations in both theory and practice.[33]

With this uncertainty among the leaders, the average farmer was resigned to credulous traditionalism and rule-of-thumb empiricism. Few read the papers and manuals or were concerned with trying new ways. So strong indeed was the prejudice against "book farming" that a leading agricultural editor evi-

[25] *Ibid.*, 1:190–192, 196–197; 2:348–357, 481–485, 653–656.

[26] *Ibid.*, 4:323–327; U. S. Department of Agriculture, *Yearbook*, 1899, pp. 376–380; Eastman, *Changing Times*, 7–18; Thomas R. Agg and John E. Brindley, *Highway Administration and Finance* (New York, 1927), 74–78; Val Hart, *Story of American Roads* (New York, 1950), 171–191; Wayne E. Fuller, "Good Roads and Rural Free Delivery of Mail," *Mississippi Valley Historical Review*, 42:67–83 (June, 1955).

[27] Most farm manuals ignored dwellings as apparently irrelevant to the main interests. See, for instance, the comment of George E. Waring in discussing "farm buildings" in his *Book of the Farm*, 50, and U. S. Commissioner of Agriculture, *Report*, 1867, pp. 283–291. An elaborate and highly interesting discussion of "Rural Architecture" was given by Andrew J. Downing in the *Horticulturist*, 1846–1851. The articles are collected in a section of his *Rural Essays* (New York, 1869), 205–286. The best practices in farm housing in the Middle West in 1880—by no means typical—are described in Prime, *Model Farms*, 391–392, 531–533, 654–656. The article on rural dwellings in Bailey's *Cyclopedia of American Agriculture* (1:238–245) presents the standard ideas of a half century ago.

[28] Michigan State Board of Agriculture, *Report*, 1874, p. 64. Cf. a similar appeal by President C. K. Adams of Cornell University, cited in Hedrick, *History of Agriculture in New York*, 427.

[29] Elizabeth A. Osborne, ed., *From the Letter-Files of S. W. Johnson* (New Haven, 1913); Alexis Cope, *History of the Ohio State University, 1870–1910* (Columbus, 1920), 441–517; *Pennsylvania Farm Journal*, November, 1853, quoted in Stevenson W. Fletcher, *Pennsylvania Agriculture and Country Life, 1640–1840* (Harrisburg, 1950), 139–140.

[30] U. S. Commissioner of Patents, *Report*, 1847 (30 Cong., 1 sess., House Executive Document No. 54, Washington, 1848), 12; Ohio State Board of Agriculture, *Report*, 1860, p. 455.

[31] New York State Agricultural Society, *Transactions*, 1856, p. 190.

[32] New York *Semi-Weekly Tribune*, March 9, 1866 (presidential address before American Institute); *Essays . . . Political Economy* (New York, 1870), 137; Horace Greeley, *What I Know of Farming* (New York, 1871), 308–309; Alvin J. Johnson, *Universal Cyclopedia* (New York, 1877), 1:60.

[33] Henry S. Olcott, *Outlines of the First Course of Yale Agricultural Lectures* (New York, 1860).

dently felt that he was showing temerity in asserting before the New Hampshire state fair, in 1853, that he was "not embarrased" in expressing confidence in the leading scientists of Europe and America.[34]

With background of extensive cultivation, farmers were more concerned with expanding production than with its betterment. They were more interested in laborsaving and accelerating devices than in improved methods. However, the years of distress from the 'seventies to the 'nineties were not propitious for marked advances either mechanically or scientifically.

Gradually the findings of the Department of Agriculture and of the experiment stations brought a formulating and systematizing of principles and practices which farmers' institutes, short courses, adapted bulletins, and the ever popular *Yearbook* brought to an increasing number of the constituency. The much publicized "new agriculture," the farmer's share in returning prosperity, while premature and overconfident in some of the claims, marked real advances in production and business methods. Fuller development in line with the trend of the national economy awaited a power resource that would provide the requisite speed, intensity, and expandibility.

Power was assuredly the key to technological advances in all lines. As in the case of the other changes, this catalytic one emerged pedestriously, and, owing to natural limitations, relatively late.

From ancient times and throughout American pioneering, the patient, dependable ox provided the power for the crude, elemental implements and the limited hauling. At that stage, in the opinion of all competent observers, this power was the most efficient and economical. Some progress was made in selection and breeding for a draft type. The alert Devon, especially when crossed with the Shorthorn for greater size, was regarded as superior.[35]

Horses from colonial days had been bred mainly for riding and driving. The faster motion demanded by reaping machinery brought them increasingly into farm use. The most suitable draft breeds and types, however, were not available for several decades. With the decline of the old locally famous Conestoga around the middle of the century, native horses, best represented by the Morgan, were too light for the heavier operations. A few Percherons were imported in the 1860's, but the large introduction of English, Scotch, and French breeds did not start until the 1880's.[36] Mules, bred mainly in Kentucky, Tennessee, and Missouri, from the 1830's were a major supply of power for the plantation but had very limited demand in the northwest.[37]

Admirable as well-bred horses and mules were for the power needs of the medium-size farm and for trucking on dirt roads, any animal power was limited for large-scale enterprises. The spectacular bonanza farms essayed mass output by multiplying inordinately the units of machines and horses without securing the efficiency of factory production. In the Far West, huge gang plows and combines were drawn by fabulous multiple hitches.[38] Obviously, to secure the gains of large enterprise, an expandable and continuously dependable power was essential and the source of such power seemed to be at hand for adaptation.

In a steam age in manufacturing and transportation it was natural and logical to draw upon the same source for the farm. Stationary power had been used in a limited way in the early 1800's; portable engines were available for threshing from the 1840's. The next and main utilization was traction power for the major operations of the farm and for local and cross-country trucking. Initial experi-

[34] New Hampshire State Agricultural Society, *Transactions*, 1853, p. 47; Oliver H. Kelley, *Origin and Progress of the Order of the Patrons of Husbandry in the United States; A History from 1866 to 1873* (Philadelphia, 1875), 17–18; Roberts, *Autobiography*, 153–163, 247–263.

[35] Olcott, *Yale Agricultural Lectures*, 158; Van Wagenen, *Golden Age*, 39–47.

[36] U. S. Commissioner of Agriculture, *Report*, 1863, pp. 175–180; Richard L. Allen, *New American Farm Book* (New York, 1879), 451; Olcott, *Yale Agricultural Lectures*, 140–141; Bailey, *Cyclopedia of American Agriculture*, 3:451–452, 455–458, 478–481, 494–496.

[37] Harvey Riley, *The Mule* (New York, 1867); Bailey, *Cyclopedia of American Agriculture*, 3:507–510.

[38] John L. Coulter, "Industrial History of the Valley of the Red River of the North," North Dakota State Historical Society, *Collections*, 3:529–672; Harold E. Briggs, *Frontiers of the Northwest; A History of the Upper Missouri Valley* (New York, 1940), 515–518; U. S. Department of Agriculture, *Technical Bulletin* No. 70 (Washington, 1928), 3; Miller, "Harvesting Machinery," 38–39; Rogin, *Introduction of Farm Machinery*, 147; Claude B. Hutchison, ed., *California Agriculture* (Berkeley, 1946), 35–36.

menting was in plowing and for a full generation from the decade of the '50's the steam plow was given continual discussion in farm journals and society and government reports.[39]

However, a decisive testing came early. Of the numerous inventions, that of Joseph W. Fawkes was the most pretentious and by far the most publicized. His ungainly engine of nearly ten tons burden performed creditably on the level, hard baked prairie of Illinois in the fall of 1858. The demonstration brought an immediate accolade from press and public that reflected uncritical wishfulness. The inventor was acclaimed a mechanical wizard whose achievement would revolutionize all farm production. Such expectations were given a sad and sudden jolt two months later when, on more typically conditioned prairie soil, the behemoth of steam mired helplessly. Overly ambitious size with added weight of fuel and water made normal operation in a humid region quite impracticable. Cable plowing carried on to a limited extent in England was not suited to American conditions. Trial of steam tractors in overland trucking proved no more feasible. Fawkes was not destined to become either a Fulton or a Ford.[40]

In spite of the seemingly conclusive failures, the hope of the arrival of the power age for the farm persisted. It was widely argued that all that was needed were certain adjustments and refinements. An especially ardent champion put the blame for the delay upon the "incredulity and prejudice" of the farmer rather than the failures of inventors and manufacturers. He had the credulous assurance that

> Our inventors are doubtless capable of meeting the issue whenever the call is made but in this, like every other commodity, there is no supply where there is no demand. We say, then to the progressive farmers, it is to you alone the country must look to wipe out this reproach to American Agriculture.[41]

Steam plowing and harvesting was to have some rather insignificant use in the large operations of the Pacific coast. But the main service in the Middle West and to a much less extent in the East was by custom threshers who hauled their equipment about—guided for some years by a horse team—with no little difficulty and subject to numerous public regulations.[42]

Greeley, while sharing the prevailing mechanical illusions as to the possibility of matching the conditions of the factory or of a smooth rail on level ballasted gradient with the heterogeneities of farm and highway, expressed with fullness and precision the varied needs for power that were three score years later to be supplied by the general-purpose tractor:

> What our farmers need is not a steam plow as a specialty, but a locomotive that can travel with facility, not only on common wagon-roads, but across even freshly-plowed fields, without embarrassment, and prove as docile to its manager's touch as an average span of horses. Such a locomotive should not cost more than $500, nor weigh more than a tun (sic) when laden with fuel and water for a half-hour's steady work. It should be so contrived that it may be hitched in a minute to a plow, a harrow, a wagon, or cart, a saw or grist-mill, a mower or reaper, a thresher or stalk-cutter, a stump or rock-puller, and made useful in pumping and draining operations, digging a cellar or laying up a wall, as also in ditching and trenching. We may have to wait some years yet for a servant so dexterous and docile, yet I feel confident that our children will enjoy and appreciate his handiwork.[43]

The mechanical performance of these and other operations were essential for a modern commercialized business. Steam was clearly not the answer and its limited use gave way with comparative rapidity to more adaptable resources.

Adequate, commensurate power for the farm came only with the general-purpose tractor on rubber tires and with the R. E. A. While passing through various stages of experimental trial, when once the basic principles were established, the crucial innovation was relatively accelerated. As late as 1921,

[39] The fullest and most authoritative history of steam in American agriculture is Reynold M. Wik, *Steam Power on the American Farm* (Philadelphia, 1953). See also for convenient summary of the stages of development in Europe and the United States, U. S. Commissioner of Agriculture, *Report*, 1867, pp. 253–280. Windmills had had a long supplemental use mainly for pumping. Prime, *Model Farms*, 129; Ardrey, *Agricultural Implements*, 136–144.

[40] Wik, *Steam Power*, 62–70; Albert L. Demaree, *The American Agricultural Press, 1819–1860* (New York, 1941), 227–230; U. S. Commissioner of Agriculture, *Report*, 1862, pp. 415–416; *ibid.*, 1863, pp. 420–422.

[41] U. S. Commissioner of Agriculture, *Report*, 1874, pp. 281–283.

[42] Wik, *Steam Power*, 70–81, 195–196; Charles L. Flint, ed., *American Farming and Stock Raising* (3 vols., New York, 1901), 1:544; Periam, *Encyclopaedia of Agriculture*, 909–911; Hutchison, *California Agriculture*, 366; Quaintance, *Farm Machinery*, 9.

[43] Greeley, *What I Know of Farming*, 244.

a leading agricultural economist could raise the question as to whether a farmer should purchase a tractor.[44] Within half a dozen years, with adapted models, the question was fully answered. And with this long-sought catalytic agency, the other technological achievements, that were appraised in an interdepartment bulletin a decade and a half ago[45] and that have been extending steadily since that time, followed.

The technical changes between the present farm set-up and that within the memory of many of us, which have come about by a gradual, relatively belated response to the demands of an industrialized age, are truly remarkable, though still not "revolutionary."

No less fundamental and far-reaching are the economic and social results and implications. Agriculture, at last, is but following the course of other businesses which have steadily increased technical efficiency with correspondingly enlarged capitalization and with combination in some form and to varying degrees. The mechanized scientific farm thus marks the passing of the traditional opportunity for diffused proprietorship. This unique measure of agrarianism was made possible not only by land abundance but also by small capitalization due to long continuing technological retardation. The family farm may persist but there will be fewer families, progressively larger and costlier enterprises, the equivalent of trade associations, and closer, more effective combination among the producers of a major commodity.

[44] H. R. Tolley, "The Farm Power Problem," *Journal of Farm Economics*, 3:91–99 (April, 1921).

[45] Interbureau Committee and Bureau of Agricultural Economics, U. S. Department of Agriculture, *Technology on the Farm* (Washington, 1940).

THE TECHNOLOGICAL REVOLUTION IN AGRICULTURE, 1910–1955

(In Part With Special Reference to the North Central States)*

WILLIAM L. CAVERT

Director of Research, Farm Credit District of St. Paul

Some contrasts between 1910 and 1955. In 1910, practically all of the power on farms was human and animal power. Autos were largely the playthings of the wealthy and until 1910 or later, the occasional farmer who had a car was looked upon by his neighbors as seriously lacking in economic sense, but by 1920 there were 2.15 million autos on farms or one car for each three farmers.

The one fairly common use of the internal combustion engine in 1910 was as a stand-by for pumping water when the wind did not blow. Practically the only tractors were steam engines used chiefly for threshing on a custom basis. Gasoline tractors were not common until the early 1920's, and were at first used largely for plowing and other heavy tillage operations. The most widely used college text on farm management prior to World War I was *Farm Management* by G. F. Warren, published in 1913. The author disposes of engines with the simple statement that "On large wheat farms, where the heaviest work of the year is plowing, engines may be used in place of horses."

In 1920, on 6.45 million farms, the census reported 2.15 million autos and only 139,000 trucks, or about fifteen autos for one truck. In 1953, on 5.4 million farms, there were 2.56 million trucks, 3.9 million tractors, and 4.4 million cars, or 1.7 cars to each truck and 1.1 cars to each tractor. The big increase in trucks had come after 1940. Only 1.05 million were reported in that year. The accompanying table gives the trend in number of

*This paper was presented at the joint session of the Agricultural History Society with the Mississippi Valley Historical Association in St. Louis, April 29, 1955.

	1920	*1930*	*1940*	*1945*	*1950*	*1953*
	no.	no.	no.	no.	no.	no.
			(Millions)			
Autos	2.15	4.13	4.14	4.15	4.20	4.40
Tractors, wheel and crawler types (does not include garden tractors)	.25	.92	1.54	2.35	3.39	4.06
Motor trucks	.14	.90	1.05	1.49	2.21	2.56

autos, tractors, and trucks from 1920 to 1953 so far as data are available.[1]

One of the features of the Annual Farmers' and Home-Makers' Week of the Minnesota College of Agriculture, held in January 1927, was a talk by one Roy E. Murphy, West Burlington, Iowa, who described his 200 acre horseless farm. However, as I recall it, he admitted that it would be difficult to operate without horses except for the fact that he was able to get the use of his neighbor's teams for bundle hauling and other operations by exchange of labor. The 1950 census reported that in Minnesota approximately 39 per cent of the commercial farms were horseless. In contrast with the situation in 1910, or even in 1930, by 1955 mechanization has progressed to the point that a farm relying chiefly on horses is a fit theme for the Sunday supplement.

General acceptance of the tractor was followed by the widespread use of such machines to go with the tractor as the corn picker, combine, windrow baler, field chopper, and manure loader. Horse-drawn combines were used on the Pacific Coast beginning about 1880. However, harvesting with combines did not make much progress east of the Rockies until about 1930.[2] The USDA estimated that less than 5 per cent of the wheat was harvested by combines in 1920, but approximately 50 per cent of the crop was combined in 1938.[3] In 1930, 61,000 combines were reported by the census; in 1945, 375,000 and in 1953, 918,000 were reported.[4]

In the case of haying machinery, the windrow baler received its great impetus in the World War II period. In 1944, for the whole United States, 13.7 per cent of the crop was harvested with windrow balers, and by 1948 it had risen to 46.1 per cent. The percentage harvested with balers has had a further increase since 1948. During the 1944–48 period, the percentage of hay harvested with the chopper increased from 1.8 per cent to 6.7 per cent.[5]

As a result of mechanization, the labor requirements to produce corn for grain in southern Minnesota have been reduced from 22.6 hours per acre in the 1908–12 period to 6.0 hours in 1953, or 73 per cent. In the case of oats, the reduction is from 12.2 hours to 4.7, or 61 per cent.[6] The reduction on spring wheat, barley, and flax is similar to that on oats.

In 1910, 72 million out of 325 million acres of harvested crop land were used to provide feed for farm horses and mules and another 16 million acres were used to provide feed for non-farm horses; so over one fourth of the crop acres were used for horse feed. In 1953, only 14 million acres of harvested crop land

[1] Data taken from U. S. Department of Agriculture, Agricultural Research Service, Production Economics Research Branch and Agricultural Marketing Service, "Principal Machines on Farms" (Mimeo, Washington, June 1954); and U. S. Department of Agriculture, Bureau of Agricultural Economics, *Agricultural Outlook Charts*, 1955, p. 26.

[2] A. J. Schwantes, G. A. Pond, A. C. Arny, C. H. Bailey, R. H. Black, L. A. Reynoldson, and W. R. Humphries, "The Combine Harvester in Minnesota," Minnesota Experiment Station, *Bulletin* 256 (St. Paul, July 1929).

[3] U. S. Department of Agriculture, Bureau of Agricultural Economics, "Acreage of Wheat, Oats and Corn for Grain, Harvested by Specific Methods and Custom Harvest and Labor Rates, 1938" (Mimeo, Washington, July 14, 1939).

[4] Data taken from U. S. Department of Agriculture, Agricultural Research Service, Production Economics Research Branch and Agricultural Marketing Service, "Principal Machines on Farms" (Mimeo, Washington, June 1954).

[5] Albert P. Brodell and Charles G. Carpenter, "Harvesting Hay and Silage," U. S. Department of Agriculture, Bureau of Agricultural Economics, *Farm Management Report* 79 (Washington, June 1950).

[6] T. P. Cooper, F. W. Peck, and Andrew Boss, "Labor Requirements of Crop Production," Minnesota Experiment Station, *Bulletin* 157 (St. Paul, March 1916). Niels Rorholm, S. A. Engene, G. A. Pond, and R. A. Hinton, "Farm Labor and Farm Costs, 1953," University of Minnesota, Department of Agricultural Economics, *Report* 217 (September 1954).

out of 349 million acres, or 4 per cent of the total were used for this purpose.[7]

Incidentally, the development of the auto resulted in 1950 in 3.45 million, or 64 per cent of the 5.38 million farms reported in the 1950 census being on improved roads. Practically 100 per cent were on dirt roads in 1910. Motor transportation has made the consolidated school and a large-scale agricultural extension education program feasible, and has greatly enlarged the shopping area and widened the horizon of farm families. It has also made great changes in the marketing and distribution of farm products.

To sum up, the gas engine in its many applications between 1910 and 1955 revolutionized rural transportation both of persons and goods, largely eliminated animal power on farms, and resulted in a completely new type of machinery, powered by gasoline and riding on rubber.

Electricity came later than the gasoline engine. The first known rural electric line was constructed in 1906 at Hood River, Oregon. In 1919, the number of farms receiving electricity from power lines was placed at only 100,000.[8] Following the advent of the Rural Electrification Administration in 1935, there was a rapid increase in the availability of electricity, and in 1940 the census reported that 45.6 per cent of all farms had an electric distribution line within one-fourth mile of the dwelling. In 1950, 77 per cent of the farms had electricity from a power line. In the North and West, the percentage of farms with electricity was over 85 per cent. At first, electricity in many cases was used only for lighting the home and other buildings. The farmer soon discovered that it was feasible to have small, medium, and large motors scattered about the farmstead as might be needed. Thus, we have electric pumps, milking machines, ventilating systems, hay and grain dryers, barn cleaners, silage unloaders, feed grinders, tool grinders, and milk coolers, and lights when and where we want them. We also have heat lamps to warm the new born pigs and lambs and thermostatically controlled electric hovers for chicks and turkey poults.

In the household, electricity in addition to providing lights, made possible the electric refrigerator, the deep freeze, and such varied equipment as the washing machine, electric dryer, electric iron, electric sewing machine, vacuum cleaner, food mixer, toaster, electric blanket, electric air conditioner, radio, and television. Who in 1910 or even in 1930 dreamed of this?

Some changes in crop technology. In the field of crop technology, we saw in 1954 a serious outbreak of army worms at scattered points in the north central states, controlled by aerial spraying at a cost of $1.50 to $2.50 per acre but that spectacular achievement is a minor item among the improvements in crop technology.

One of the major triumphs of the agronomist has been the introduction of soybeans and the development of the associated technology to the extent that in 1953, soybeans were the second most important crop from the standpoint of cash sale in Iowa, Illinois, Indiana, Minnesota, and Missouri. In the whole United States in 1953, the only crops exceeding soybeans in dollar volume of cash sales were lint cotton, wheat, corn, and tobacco. In 1954, the only crops exceeding soybeans in acreage were hay, corn, wheat, oats, and cotton.

In the 1910 census, there is no mention of soybeans. The earliest national estimates on soybeans reported by the U. S. Department of Agriculture were for the year 1924, when 1.78 million acres were grown, of which only 0.45 million acres were harvested for beans. In 1954, the total soybean acreage was over 17 million acres, which produced 343 million bushels.

The author was first introduced to the soybean crop in 1912. As a recently employed instructor at the University of Minnesota, I was shown about the agronomy plots by Professor A. C. Arny. Among the plots were a few trials of soybeans. Professor Arny was hopeful that the crop might be of some future importance. His optimism seems to have been fully justified.

In the last ten years, it has become commonplace to control mustard and other nongrassy weeds in flax and small grains with chemical sprays, to do a large part of the weeding of such vegetable crops as onions and carrots with chemical sprays, and in the

[7] U. S. Department of Agriculture, Agricultural Research Service, Agricultural Research Branch, "Changes in Farm Production and Efficiency" (Washington, June 1954).

[8] U. S. Department of Agriculture, Bureau of Agricultural Economics, "Technology on the Farm, A Special Report by an Interbureau Committee and the Bureau of Agricultural Economics" (Washington, August 1940), 109.

Southwest to largely eliminate brush and weeds from range land by chemicals.

The use of commercial fertilizers has been a common practice of farmers in Europe and in the Atlantic seaboard states for several generations, but up to 1940, many farmers west of the Mississippi and east of the Rockies had never seen a sack of commercial fertilizer. Now we are finding that on the best corn belt soils throughout the Corn Belt, corn gives a generous response to nitrogen and frequently also to phosphorus and potash. In 1954, at a number of places in southern Minnesota and other Corn Belt points, one saw for the first time facilities at local stations for storing and distributing anhydrous ammonia, and it seems likely that in the future a substantial portion of the midwest corn acreage will get 20 to 75 pounds of nitrogen per acre, plus in many cases, substantial amounts of phosphorus and potash. In addition, increasing amounts of commercial fertilizers are being used on meadows and pastures and on small grain crops. In 1910, the total nutrients used in terms of nitrogen (N), phosphoric acid (P_2O_5), and potash (K_2O) were 844,000 tons; in 1940, 1,679,000 tons; and in 1953, 5,324,000 tons.[9]

One of the great triumphs of the corn breeder was the development of hybrid corn varieties, the use of which during the late 1930's and early 1940's became standard in the major producing areas and increased the yield per acre about 20 per cent. According to the USDA *Yearbooks*, 2 per cent of the corn acreage in the 12 north central states was planted to hybrid varieties in 1936. In 1946, in these states, 91 per cent was planted to hybrid varieties.

It has now become commonplace in the better soil areas to hear of yields of 100 bushels of corn to the acre and yields of 125 or more bushels are occasionally secured where formerly 75 to 80 bushels per acre were the upper limit. As an example of the increase in corn yields per acre, one may note that the 1918–27 average in Illinois was 35.3 bushels per acre and in the 1943–52 decade it was 51.6 bushels, an increase of 46 per cent. The increase in yield on a percentage basis was greater in Illinois than in other Corn Belt states. This increased yield of 46 per cent reflects the gain from a combination of improved practices, including the use of hybrid seed, more fertilizer, better weed control, and better machinery.

Fertilizers, in combination with other improved technology, are not only making it possible to raise more bushels of corn per acre but a limited amount of experimental work suggests that it may be possible on rich, levellying corn lands where erosion is a minor problem, to have 60 per cent or more of the acreage in corn and still maintain productivity indefinitely. It seems likely that the liberal use of nitrogen combined with other fertilizers is in the process of boosting the yield per acre in the good corn areas another 15 to 20 per cent. The average yields in such states as Illinois, Indiana, and Iowa may be in the neighborhood of 60 bushels per acre by 1965.

The agronomists have not been able to get the same consistent percentage increase in the yield of spring small grain crops largely because as yet they have not achieved varieties that are consistently resistant to the various races of rust over a period of years. The possibilities are good over the next several years for getting the same percentage increase from fertilizers in output of grass and legume crops per acre as is being secured in the case of corn.

Irrigation comes to the humid areas. Since World War II, aluminum pipe has given irrigation an increasing place in the agriculture of the humid areas. The light weight of aluminum makes it feasible to move the pipe from place to place as needed. Already an important fraction of the potatoes, vegetables, and berries in the humid areas are grown with the aid of irrigation and it is likely that where cheap water is available, irrigation will be used quite generally on berries and the more intensive vegetable crops and to some extent on cotton, tobacco, pastures, and corn. The census reports the acreage of irrigated land in farms in the United States by decades as follows:

Years	*Acres Irrigated* (millions)
1899	7.7
1909	14.4
1919	19.2
1929	19.5
1939	18.0
1949	25.8

Of the 25.8 million acres irrigated in 1949, 640 thousand were irrigated by aluminum pipe. Of the total amount irrigated by alumi-

[9] U. S. Department of Agriculture, Agricultural Research Service, Agricultural Research Branch, "Changes in Farm Production and Efficiency" (Washington, June 1954).

num pipe, 61 per cent was in the Central, Eastern, and Southern states and 39 per cent in the Pacific and Mountain states. It is certain that there has been a large increase in irrigation in the Southern, Central, and Eastern states since 1949 and a substantial further increase may be expected in the next ten years.

Of the states entirely in the humid area, Louisiana and Arkansas were the leaders in irrigation in 1949, with a total of nearly a million acres. The irrigated land in these states is largely planted to rice. In 1949, there were 547 thousand acres of rice in Texas, which is almost entirely on irrigated land in the humid part of the state. The total acreage of rice increased from 0.61 million acres in 1909 to 2.41 million acres in 1954. In 1954, it was practically all on irrigated land in the humid area, except 0.45 million acres grown in California.

Livestock husbandry. In the agricultural colleges prior to World War I, the courses in feeding and nutrition of animals were largely concerned with the question of the protein requirements for meat, milk, and egg production. Now the science of nutrition is a bewildering array of data on protein requirements, with much emphasis on the adaptabilities of particular kinds of protein to specific kinds of animals, plus an even more bewildering array of data on mineral and vitamin requirements. And, currently, the place of antibiotics and hormones in animal husbandry is receiving major attention.

One of the triumphs of dairy science is the artificial insemination of dairy cows. In 1940 in the United States, less than 35 thousand cows were artificially inseminated; in 1950, 2.6 million; in 1953, 4.3 million; and in 1954, perhaps 5.0 million, or about 21 per cent of the dairy cows in the United States. The United States average of all artificial breeding associations in 1952 was 1,848 cows bred to one sire.[10] Up to 25,000 cows have been bred artificially to one bull in one year. The use of relatively few superior sires by this technique makes it possible to get a rapid increase in the inherent productivity of the national herd. Incidentally, it also greatly decreases the field for breeders of pure-bred dairy cattle, whose main usefulness is to supply superior bulls to their neighbors.

In the case of hogs and poultry, it has become possible to keep large numbers without undue risk from disease. Prior to about 1915, heavy losses from hog cholera epidemics made it exceedingly speculative to raise hogs in large numbers. A successful hog cholera serum was demonstrated by the U. S. Bureau of Animal Industry at Ames, Iowa, in 1907. It is estimated that in 1913, 10 per cent of the hogs in the United States died from hog cholera.[11] Soon thereafter, protective vaccination became quite general, especially in the neighborhood of outbreaks. There was also an increasing percentage loss from intestinal parasites and filth diseases as the size of the herd increased. By the early 1920's, the scientists had worked out the life history of the intestinal round worms of hogs and poultry. Soon it was demonstrated that hogs and poultry could be kept reasonably free from internal parasites and filth diseases by a carefully handled sanitation program.[12]

Then we began to get large herds of hogs and large flocks of poultry. Among 22 co-operators in a farm accounting project in Cottonwood and Jackson counties, Minnesota, in 1921–1923 inclusive, only one co-operator was found who produced over 30,000 pounds of gain on hogs in a year;[13] in 1940, the average production of 160 co-operators in southwest Minnesota was 21,907 pounds, and in 1951 the average production of 111 co-operators was 43,637 pounds.[14] In recent years in several instances, over 100,000 pounds of gain per year have been secured. Top production by a co-operator in one year to date is 315,000 pounds.

The story is similar in regard to poultry. In 1910, practically all of the chickens were either hatched under hens or in 100 to 300 egg incubators heated by kerosene lamps and tended by the farm housewife. In the college year, 1910–11, the writer took a course in

[10] U. S. Department of Agriculture, *Agricultural Statistics, 1953*, p. 403.

[11] C. N. McBryde, "Hog Cholera," U. S. Department of Agriculture, *Yearbook 1942*, pp. 673–685.

[12] E. T. Robbins, "Cheaper and More Profitable Pork thru Swine Sanitation, A Review of the McLean County System of Swine Sanitation on Illinois Farms during 1925," Illinois Agricultural Experiment Station, *Circular* 306 (Urbana, February 1926).

[13] George A. Pond and Jesse W. Tapp, "A Study of Farm Organization in Southwestern Minnesota," Minnesota Experiment Station, *Bulletin* 205 (St. Paul, November 1923).

[14] "Summary Report of Southwestern Minnesota Farm Management Service, 1940–1951," University of Minnesota, Department of Agricultural Economics, *Report* 206, p. 39.

poultry husbandry at Cornell University. Practically no mention was made of the problem of internal parasites. During the spring of 1911, the class visited a small commercial hatchery that had recently set up business in Ithaca. The instructor said that it was one of the few in that part of the United States, but he reported that the commercial hatchery idea had taken hold in the Petaluma area of California.

In the 1921–23 period, among a group of co-operators that kept farm accounts in co-operation with the University of Minnesota, Division of Agricultural Economics, the top number of hens kept per farm was 275 and large flocks of turkeys were unknown. Now, flocks of 500 to 1,000 chicken layers are fairly common and the writer knows of two operators in Minnesota, each of whom is carrying over 50,000 layers. In the case of turkeys, small flocks have almost disappeared. In 1920, 23,800 producers on January 1 had 143,000 turkeys, or an average of about six per producer. These were, doubtless, for the most part breeding stock. The total number raised in 1920 was not reported by the census but perhaps was roughly in the area of 400–to 500,000. Dr. W. A. Billings, veteran turkey extension specialist of the University of Minnesota, says the first flocks of 1,000 birds or more in Minnesota were raised in 1925 or 1926. In the 1950 census, in Minnesota, the number of farmers reporting turkeys raised was 3,200 and the number raised was 3.44 million, or over 1,000 per farm. Dr. Billings tells me that in 1954 there were several flocks of over 50,000 birds in Minnesota.

In the case of broilers, a recent Maryland study[15] indicates that broilers in flocks of 8,000 and over, with modern equipment, are handled with no more labor cost per hundredweight of gain than is used on hogs and fattening cattle on well handled farms in southern Minnesota.[16] Until perhaps about 1940, this would have been almost inconceivable to any poultry raiser.

Let us now briefly review some changes in the requirements for successful farming that have been emphasized by the changing technology:

1. *More emphasis on management.* It is evident that the modern farmer is faced with a far more complicated set of questions to be decided than was his father. For example, in putting up hay, the choice for the father in most cases was between a hand pitchfork, a hay loader hitched behind a horse-drawn wagon, and the buck-rake and overshot stacker combination. Now among the methods to be considered are the following: (a) the field baler, with choice between many sizes and types, between wire and twine tying, and with choice between various kinds of wagons and loading devices. (b) The forage chopper plus various types of wagons with unloading devices. With the forage chopper, there is also the choice as to whether all or part of the grass acreage will be harvested as grass silage. If harvested as grass silage, it may be put into a glass-lined silo, costing perhaps $5,000, with a minimum loss of feed value and having an automatic unloading device, or it may be put in a conventional cement or clay block silo or in some type of stack or trench silo. If the decision is in favor of some type of trench silo, there may also be the question as to whether the cattle may be successfully self-fed directly from the silo without taking the silage to the cattle. (c) Stacking with the hydraulic stacker and moving the stacks to the feeding lot by skidding them onto a specially devised wagon may be one of the alternatives, especially in ranching areas. (d) A fourth alternative may be to hire a part or all of the equipment for putting up hay or silage by any of the previously mentioned methods. (e) With any of the foregoing harvesting methods, except the making of grass silage, the present day farmer has the question of whether he will install artificial drying equipment. Again, if he decides in favor of drying equipment, he has the choice between the heated air types and those that use unheated air.

It is evident that the farmer of today has many decisions to make that require the ability to analyze the probable returns from a number of alternative procedures each involving a large investment. Furthermore, in the particular instance cited, the making of them involves not only the ability to estimate the yearly costs per ton of putting up hay by each of the alternative methods that may be suitable to his situation but also an estimate

[15] Harold D. Smith, "Broiler Costs and Returns, 1947–52," University of Maryland, Agricultural Experiment Station, *Miscellaneous Publications* 167.

[16] Niels Rorholm, S. A. Engene, G. A. Pond, and R. A. Hinton, "Farm Labor and Farm Costs, 1953," University of Minnesota, Department of Agricultural Economics, *Report* 217 (September 1954).

of the comparative feeding value of the hay secured by each method.

In order to handle these and the other numerous problems, the successful farmer of today must of course have the elementary virtues of honesty and industry, but to these must be added an understanding of mechanics, business analysis, nutrition, and fertilizers. These are as difficult to acquire as are the technical requirements of an administrator in big business.

It is likely that twenty years hence most of the farmers in good farming areas will have had formal training in agriculture, in school or college, and the really successful ones will be those who have the inquiring eager-to-know type of mind that stimulates them to continue their education after they leave school.

2. *Trend toward more specialization.* The trend in farming is strongly toward specialization. This trend may be pinpointed by consideration of the cutover area of Wisconsin and Minnesota. In a considerable part of this area it was customary up to the 1930's to base the farm operations on dairy cows, potatoes, and hogs. The potatoes, usually five to ten acres, provided a good market for the manure from the dairy cows, and were largely raised with family labor and with little extra machinery investment except a horse-drawn digger, and with little or no cash outlay for fertilizer and usually with none for spraying except for a few pounds of Paris green or lead arsenate for the Colorado potato beetle. But the introduction of involved disease control techniques and two-row tractor machinery has greatly increased the yield per acre and shifted the business to the areas in the Red River Valley and elsewhere where potatoes are raised in tracts of 50 to 100 acres and upward to 500 or more. The trend away from potatoes may be illustrated by the fact that in 1920 there were 12,180 acres of potatoes in Chippewa County, Wisconsin, and in 1950 there were 510 acres.

In parts of Langlade County, Wisconsin, the soil, climate, and in places, the possibility of low cost irrigation, combine to favor the new technology. There the average yield per acre was 126 bushels in the 1940–44 period and 299 bushels in the 1948–52 period. The acreage has shifted from 6,150 in 1920 to 13,910 in 1930, to 10,540 in 1940, and to 9,410 in 1952.[17]

The farmer in the cutover areas ordinarily had some hogs. These were used primarily to provide a market for the skim milk but when the manufacture of skim milk powder and pickup of milk at the farm came in, there was no skim milk to utilize and the raising of hogs greatly decreased. About the same time, the farmer got electricity, which greatly facilitated the use of milking machines. If he had a milking machine and the necessary roughage, he could handle more cows to advantage, so in many cases the farmer in the cutover areas is now deriving nearly all of his income from dairy products and from the sales of cows and calves that are incidental to the production of milk. If he is successful, he is handling a much larger herd than formerly.

In the corn producing areas, the trend toward specialization is less pronounced than in the case of most other types of farming but there is an increasing tendency toward specialization in poultry, dairying, hog raising, cattle feeding, and lamb feeding.

Is the specialized farmer as well able to pay debts as his predecessor? That depends. If he is one of the more skilled ones, if along with his specialization the dairy farmer gets 300 to 450 pounds of fat per cow from a herd of 20 to 40 cows or more and is able to do it by making maximum use of good forage and hay, he is probably much more able to pay debts than was his predecessor. But he needs to be something of a student and to have plenty of ability if he is going to get the 300 to 450 pounds of fat per cow and avoid an excessive overhead in buildings and machinery. But if the management is poor, due to the high cash outlays, he can also lose money faster than could his father.[18] This is indicated by the fact that in Southwest Minnesota in the 1948–52 period, cash operating expenses were 56 per cent of cash receipts. If one includes depreciation on machinery and buildings and income tax, 69 per cent of cash receipts went for expenses, 16 per cent went for family living expenses, and only 15 per cent was left for investments and payment of interest and principal of debts. This was in a period when prices and crop yields were

[17] Wisconsin Crop and Livestock Reporting Service. *Langlade County Agriculture* (July 1953).

[18] "Claims Against Each Dollar of Farm Income, Southwest Minnesota, 1940–52," Farm Credit District of St. Paul, Research Division, *Circular* 53-36 (Based on University of Minnesota data).

very favorable so expenses were a smaller percentage of receipts than would have been the case in less favorable years. Data that are only roughly comparable indicate that in 1913, cash expenses were only about 28 per cent of the receipts.[19] In the earlier period, the farm family also produced a larger percentage of its food, fuel, and transportation.

3. *Modern technology and land values.* Modern technology tends to put more of a premium on the better land, especially the better corn land. One might think that in view of recent developments in soil science having to do with more effective methods of using fertilizer and with soil conservation techniques for sandy and rolling land, the tendency would be for the spread between the better and poorer lands to narrow. But this is not the case. In some of the poorer soil areas, land has been almost continuously going out of cultivation. For example, in New Hampshire the amount of tillable land in farms decreased from 1.08 million acres in 1900 to .45 million in 1950, a decrease of 58 per cent.[20]

On the other hand, recent experiments at several corn belt stations, as well as limited experience of a few farmers, suggests that in the future on the more level lands it will be feasible, by the liberal use of nitrogen and other fertilizers, to raise corn on perhaps 60 per cent or more of the tillable acreage. Formerly few farmers, except cattle feeders in the best areas, raised corn on as much as 50 per cent of their tillable acres and managed to maintain a high level of productivity. In general, if one is making a large investment per acre in fertilizer, the safest place to put it is where the benefits from the fertilizer are least likely to be lost because of frost, drought, or other hazards, and where there is a large response to one or two elements rather than to seek to improve the land that requires large quantities of lime, nitrogen, phosphate, and potash in combination.

4. *Favorable location.* The premium for a favorable location is greater than formerly. At first thought one might conclude that the general introduction of modern conveniences would have lessened the premium for a favorable location. However, when everybody lived on a mud road and used horses, it didn't make much difference whether one lived on the main road or on a side road. Again, in a day when only an occasional farmer had electricity, it was no great deprivation to be without it, but when nearly everyone has it, no one wants to live where electricity is not available. So in the modern day the discount for the lack of a good road and lack of electricity is greater than ever. Today, being off the good road may mean lack of a milk pickup, of school bus facilities, and in some cases, the lack of electricity and telephone service. Recently, it is reported to me by land bank appraisers in Michigan that being in an area where the television reception is poor has a detrimental effect on farm land values. So the alert lender on real estate will pay more and more attention to location and the availability of modern conveniences and perhaps adjust his sights upward on the better located properties and in the case of the poorly located properties lend chiefly on the value of the bare land.

5. *More products with less labor.* As will be seen in the following table, the total farm labor force shrank from 13.6 million in 1910 to 8.6 million in 1953. In the same period, the total population, including armed forces overseas increased from 92 to 160 million. Thus in 1910, disregarding exports and imports, there was one agricultural worker for 6.8 people; in 1953 there was one worker for 18.6 people. Thus in 1953 each worker produced agricultural products for 274 per cent of the number for which he produced agricultural products in 1910. In addition, the population was better fed in 1953 than in 1910 in that the diet included less wheat and potatoes and more of such relatively expensive foods as meat, poultry, eggs and dairy products, except butter.

The following table gives an over-all picture of the trends in farm labor force and in over-all farm output.[21]

[19] Andrew Boss, A. H. Benton, and W. L. Cavert, "A Farm Management Study in Southeastern Minnesota, Factors Influencing Profits." Minnesota Experiment Station, *Bulletin* 172 (St. Paul, October 1917).

[20] W. L. Burkett, "New Hampshire's Idle Farm Land," New Hampshire Experiment Station, *Bulletin* 399 (Durham, September 1953).

[21] Data based on U. S. Department of Agriculture, "Farm Labor," January 13, 1954, and U. S. Department of Agriculture, Agricultural Research Service, Agricultural Research Branch, "Changes in Farm Production and Efficiency" (Washington, June 1954).

Year	No. in farm labor force	Total population of continental U. S. including armed forces overseas	Number in population for each farm worker	Total agricultural output (1947–49=100)
	(millions)	(millions)		
1910	13.56	92	6.8	61
1920	13.43	106	7.9	70
1930	12.50	123	9.8	72
1940	10.98	132	12.0	83
1950	9.34	152	16.3	100
1951	8.98	154	16.9	103
1952	8.67	157	18.1	107
1953	8.58	160	18.6	108
%1953 is of 1910	63%	174%	274%	177%

Although the 1953 farm labor force was only 63 per cent of that in 1910, agricultural politics in 1955 centers around surpluses, but in 1910 there was considerable apprehension as to the adequacy of food supplies for the future. Of course this increased production was in part achieved by the aid of city workers who in 1954 are supplying the farm population with gas, oil, farm machinery, fertilizer, and other supplies to a far greater extent than in the horse age.

6. *The family type farm is holding its own.* Based on the percentage of the labor force that is hired, farms are now more generally of the family type than in any other period for which data are available beginning in 1910.[22]

Year	Total farm employment	Family Workers	Hired Workers	% hired workers are of total
	(millions)	(millions)		
1910	13.56	10.17	3.38	25%
1920	13.43	10.04	3.39	25
1930	12.50	9.31	3.19	26
1940	10.98	8.30	2.68	24
1950	9.34	7.25	2.09	22
1951	8.98	7.00	1.99	22
1952	8.67	6.75	1.92	22
1953	8.58	6.65	1.93	22

7. *Trend toward larger units.* The homestead law of 1862 made homesteads of 160 acres available for a modest filing fee and five years of residence plus very modest improvements. Presumably the 160-acre figure was set with the idea that this would make a farm of generous size for a farm family. For the humid areas, the 160-acre concept continued to fit fairly well until the advent of the tractor. However, the introduction of the gang plow and other machinery designed for four or more horses made the 160-acre unit somewhat inadequate in respect to the efficient use of labor and machinery in the more level stone free areas, even before the gasoline age. In recent years there has been a marked trend toward larger farms in spite of the fact that the consolidation of farm units after buildings, fences, and wells have been installed involves a considerable charge-off of duplicated equipment and calls for a shift of a portion of the rural population to urban centers. Such a shift is made most easily in times of full employment when jobs are readily available in cities.

In the poorer areas, the shift is frequently made by the departure of most of the youth for town jobs, while the old folks continue to live on the farm and do such farming as their resources and vigor permit. When the old folks are no longer able to farm, the land is combined with that of a neighbor either by sale or rental or in extreme cases, it may lie idle.

The employment situation plus the continued strides toward mechanization have favored such a development since 1940. As a result, from 1940 to 1950 we had a fairly rapid increase in the average size of farms,

[22] Data based on U. S. Department of Agriculture, "Farm Labor," January 13, 1954.

AVERAGE ACRES PER FARM

State	1910	1920	1930	1940	1950	Percent increase 1940 to 1950
Wisconsin	118.9	117.0	120.3	122.5	137.8	12%
Missouri	124.8	132.2	131.8	135.6	152.7	13
Nebraska	297.8	339.4	345.4	391.1	442.9	13
Montana	516.7	608.1	940.3	1110.7	1688.7	52
Minnesota	117.3	169.3	166.9	165.2	183.6	11
North Dakota	392.3	466.1	495.8	512.9	629.9	23

especially if one could eliminate from the count the part time farms of suburban dwellers. Census data are given below for a few states to indicate the general trend.

The trend toward larger units is particularly pronounced in the Plains states where buildings are a relatively small percentage of farm real estate value.

It is likely that, provided we have reasonably full employment, there will be a trend toward larger farms in all sections of the country for the next ten to twenty years. As has been noted up to the present, at least, the trend has been toward family farms in that hired labor is now less of a factor than formerly; but in the good farming areas, under present and prospective conditions, the family farm does and will involve large amounts of capital. This does not imply that the family needs to own all of the capital. If one has ability and some accumulations of capital, studies by the University of Minnesota indicate that the way is open to get the use of other capital by rental and borrowing.[23]

[23] H. W. Swanson, G. A. Pond, and W. L. Cavert, "Starting Farming Today," University of Minnesota, Department of Agricultural Economics, *Report* 211.

The amount of capital that may be involved in a family farm under current conditions is illustrated by a farm that the writer visited in Illinois in 1952. This was a rented farm of 468 acres, said to be readily worth $475 per acre or nearly a quarter of a million. This farm was operated by a tenant who had an investment of about $45,000. The total investment in this farm business, at then current market prices, was about $270,000. The labor force in addition to an able-bodied tenant about 40 years of age, was a full-time hired man, plus the assistance of a high school son during vacation and a few days of extra help at rush seasons. It appears that if this tenant had had two grown sons at home, he would have needed to rent additional land in order to utilize efficiently the family labor.

Of course there are not many areas where the capital requirements for a successful farm are as high as in Central Illinois, but in much of the country $40,000 to $100,000 on the basis of current market values, is about the total investment needed for an efficient family farm.

So it appears that if the efficient use of our resources in family farms is the goal, that there is still ahead a large amount of adjustment toward larger family farms.

A CASE STUDY OF URBAN IMPACT ON RURAL SOCIETY: VERMONT, 1840–80*

T. D. SEYMOUR BASSETT

Earlham College

My job as a historian of urban-rural intercourse is to make a comprehensive case study, beyond the possibility of precise analysis, and give impressions that suggest new insights. My answer to the frontier school, the urban, or any other school of special emphasis, is that it takes two forces to make a conflict, or a movement.[1] I have used the hypothesis that social change occurs when differing groups are in contact and incorporate traits which best fit habitual patterns; that change is most rapid, extensive, and enduring when differences are small, conflict is through discussion and not violence, and acceptance is unconscious and skillfully mediated by reference to tradition. Conditions were favorable for social change in nineteenth century Vermont.

The difference between the hill country and New York, Boston, or Montreal in 1840 was obvious. Vermont had thirteen towns with between 2,500 and 4,000 people, and no cities. Four fifths of its breadwinners engaged in an agriculture poised between a past emphasis on wool growing and a new emphasis on dairying. Unlike the city dwellers, they had long, rough roads and could be isolated in winter or "mud-time." Their country politicians played a home game, with little reliance on major league campaigners. Bible and tract societies and several denominations considered the state a mission frontier. To barnstormers, it was one edge of their circuit. Professional musicians like Lowell Mason thought its tastes uncouth. It had country stores, country inns, a country press, country doctors, country classical and medical colleges and academies, and country pastimes.

The Vermont tradition, with which any social change would have to be identified, was a blend of national traits, filial ties with the lower northeast, regional kinship with the upper northeast, and state individuality. Local particularism grew out of individualistic settlement, resistance to New York authority, the free-wheeling, revolutionary skirmishes of the Green Mountain Boys, fourteen years as an independent republic, and its original self-sufficient economy. Vermont habitually bargained between Canadian, New York, and New England competitors. As the first fruit of the American colonial policy which accepted grown daughter states as equals, Vermont usually accepted suggestions from its parent area. The large, generalized part of the tradition, held by a homogenous population overwhelmingly Protestant and English, would provide common background for any urban-rural adjustment.

In the age of Jackson, a web of communication and trade already meshed the hill country with its valley towns, the nearby seaports, the national capital, and the West. The bustle of boats spread prosperity along the Champlain-Hudson waterway and provided the most rapid New York-Montreal circulation. Southeastern Vermont exchanged with the Boston or Connecticut valley areas by team, stage, post coach, and raft. Thus a two-way representative system of freight handlers and dealers provided trade contacts, of which the lines between seaport and village were more traveled than any other.

Social intercourse was more diverse. A trickle of migration to and from cities, if only for business training, can be assumed, although the bulk of the movement was from one rural area to another. Vermont received a stream of books, weeklies, and special interest periodicals, but from many sources other than Boston and New York. Lyceums, concerts, and minstrel shows brought city novelties and notions. Politicians attended city conclaves and broadened their contacts at Washington boardinghouses, while customs men and lawyers corresponded with Washington agencies.

Cultural institutions have faced the urban

*This paper was presented at the joint meeting of the Agricultural History Society with the American Historical Association in New York, December 28, 1954.

[1] "Increasing efficiency in agriculture and urbanization are two sides of one movement." Arthur W. Ashby, "The Effects of Urban Growth on the Countryside," *Sociological Review*, 31:345 (October, 1939).

mecca ever since they turned away from the cloister, but perhaps at no other period in modern times has the orientation been more diffused. Decentralized religious organization on the congregational pattern was more widespread than a denomination; college leadership was shared by many small town institutions; and Concord would not bow to Boston. Yet in every branch of activity, the city was in touch with the country, and imitation, whether in education or ethics, occurred in both directions.

Difference of urban and rural interests was probably sharpest in the market for farm produce, with prices at a general depression low in the early forties.[2] Rural Vermont wanted advantages over western, foreign, and other competitors in nearby markets; the cities wanted advantages over rival cities. The country press and revived agricultural societies promoted a long list of palliatives and makeshifts without visible economic effects in the forties: conservation, crop specialization, new breeds, crops, and methods of tillage, introduction of labor-saving machinery, local processing (as of potatoes into starch), cooperative wool depots, and higher tariffs. When from various motives the farmers, village merchants, owners of isolated mills, and city capitalists joined to improve first water and then land transportation, the economic effects were immediate, extensive, and enduring. Although the ultimate effect of the railroad and subsequent use of new power resources is what some call the urbanization of the countryside, friction was merely shifted to another focus at each stage of the process.

Charles Francis Adams, Jr., and other alert contemporaries, as well as such current writers as George W. Taylor, have shown the overwhelming influence of the transportation revolution. But to call this influence urban, as others have done, is like calling the father the only parent. Boston supplied the lion's share of the $26,000,000 which by 1855 had been spent on railroads in Vermont, and urban railroad managers exercised a continuing influence over their local lieutenants. Several millions went to the farmers for land damage, provisions, and teaming. The $31,000,000 increase in the value of Vermont real estate in the decade after 1850[3] can be attributed directly to the railroads, only indirectly and in part to the cities. We cannot call every change in rural life, resulting from better transportation, an urban impact. We shall have to exclude after mere mention the stories of the eclipse of the no longer needed tavern stands, the shift of teamsters to the short haul to depot, wharf, or factory, the departure of the stagers for the West where the horse was still supreme, or their absorption into the new system. Turnpikes were abandoned and canal projects ended. Owners of forests near the rails found a temporary market for cordwood to feed the locomotives. With the Civil War, coal began to replace wood in fueling steamboat, railroad, and factory engines and in heating homes. Those glorified turnpikes, the plank roads, were chartered by the dozen in the fifties to get the farmers out of the mud and down to the depot, but they proved forlorn hopes. Even the hair-of-the-dog remedy of short lines, attempted after the Civil War through local private subscriptions and town bonds, or hopefully projected as parts of Portland's attempts to throw off Boston shackles and control its own through route west, created for the most part nothing but financially shaky feeders. These were all consequences of technological change, but only the short line fever showed much direct urban influence.

Nevertheless, since good roads were essential to prosperous farming, and only the farms without them could be insulated from urban attractions, the railroads laid the foundations for more rapid urban penetration. A process like electrolysis occurred wherever the railroad's iron spike was thrust into the silver solution of the hinterland: the areas next to it were strengthened; the others weakened. Urban impact is apparent in the population movements that ended the relatively even distribution of the previous era. They made the lake port of Burlington grow into a city and dream of becoming the state capital. They shifted county seats. They rolled the centers of villages like Rutland downhill to the depot, and made a new center in more than a dozen towns. The trickle to the cities and towns became a steady stream from the hill country, and emigration was balanced by the influx of

[2] T. M. Adams, *Prices Paid by Farmers for Goods and Services and Received by Them for Farm Products, 1790–1871; Wages of Farm Labor, 1780–1937* (Burlington, 1939), 24–25, 30–39.

[3] *Message of the Governor to the General Assembly of Vermont, 1867* (Vermont Public Documents no. 1, Montpelier, 1867), 11–12.

Irish and French Canadians, some of whom took up abandoned farms.

The urban desire for through freight conflicted with the rural Vermont need for local service. Rail managers did what they could to develop the local traffic in lumber, lime, marble, livestock, butter, and cheese, but most of their receipts came from the long haul. The thousand tons of cheese carried by the Vermont and Canada Railroad in 1860 was four times the 1851 figure. The introduction of refrigerator cars in 1851 almost tripled the butter shipments from St. Albans, in seven years, to 1,350 tons. Instead of holding butter on the farm until cool weather and then getting only twelve and a half cents a pound, farmers began to take advantage of the higher summer prices in Boston.[4] This was a temporary advantage until Middle Western dairymen entered the competition and Vermont shifted again, this time to fluid milk. Even shorter lived was the lead held by Vermont livestock in the markets of Cambridge and Brighton, near Boston. Vermont shepherds slashed their flocks to get from under a failing business, while general farmers culled their cattle until local shipments were eclipsed about 1857 by the transport of Middle Western stock.[5] Exposure to the cold blasts of competition eventually required the development of an agriculture which could exploit Vermont's proximity to cities.

In industry and trade, railroad, rural, village, and urban factors combined to destroy many and elect a few to survival. Household industry declined in direct relation to the nearness of railroads,[6] and because of the resulting competition with urban fabricators. The bankruptcy of the smaller mills with a restricted rural market was more directly caused by national competition, particularly with the urban industrial leaders. The survival of the stronger factories, which gathered labor from the surrounding farms as well as from immigrant sources, and used some local raw materials, resulted from both local and urban factors. The story of the Champlain mill at Winooski, which the American Woolen Company closed in the fall of 1954, illustrates the combination of these elements. It was incorporated in 1836 as a Burlington owned and operated broadcloth mill. Boston capital reorganized it in 1845, and its Boston commission house attached it four years later. Sold and retooled in 1851 to follow urban fashions, the mill severed its main connection with the surrounding country about 1858, when its mechanics invented a burr-crusher which enabled it to use cheap Argentine wool.[7] The industrial developments after the Civil War, encouraged by tax exemption and other favors similar to those being granted in the South today, were sought as a universal means of grace and hope of glory. Much more urban investment and management appeared in marginal copper and iron mines, marble and slate quarries and mills, lumbering, woodworking, and pulp mills. But the manufacturing tonic proved something less than a guaranteed ticket to the pearly gates of prosperity.

The New Look about farms along the railroads, "the more minute attention paid to matters and articles of sale,"[8] and the growth of cash transactions at the expense of barter indicated a shift toward urban business standards. But even in 1880, the general store, extensive petty credit, sluggish turnover, and some barter characterized the retail trade of the hamlets in the hills. An old man would not have noticed much difference there from the stores of his childhood. Only the large towns had adopted cash and carry, specialties, dime and department stores, soda bars, and steam laundries, or had to cope with the rapid turnover of customers and partnerships and the general "fast horse" tempo of the cities. Emigration and the tendency of more farmers to buy in larger towns more often accounted for the prolonged contrast. Another change since 1840, for prosperous farmers at least, was the increase in fire, casualty, stock, and life insurance and savings accounts with large town and out-of-state urban institutions, which had expanded mightily in a generation.

The valley villages, for all their country appearance and talk, were not only agents of the city's economic impact but also spearheads

[4] "The Journal of Jonas Wilder, Railroader," *Vermont Quarterly*, 14:123–127; Rutland *Herald*, January 13, 1859, June 12, 1868; Edward Hitchcock, *Report on the Geology of Vermont* (2 vols., Claremont, New Hampshire, 1861), 2:923.

[5] See weekly quotations in most Vermont weeklies, and comments, *e.g.*, Montpelier *Patriot*, December 14, 1848; Montpelier *Watchman*, April 1, 15, 1852; Rutland *Herald*, February 23, 1855, quoting St. Johnsbury *Caledonian Herald*, August 13, 1857.

[6] See Rollo M. Tryon, *Household Manufactures in the United States, 1640–1860* (Chicago, 1917), 11, 166, 244–248, 313, 370.

[7] The early history of this mill is summarized in the weekly Burlington *Free Press*, May 17, 1872.

[8] Rutland *Herald*, February 5, 1852.

of urban political, social, and cultural penetration. Besides the local merchants and manufacturers and their lawyers, the village newspapermen, with wide contacts in both city and country, were invaluable allies who could be counted on to whoop it up for the distant evil and the local good. Many clergymen chimed in. State and federal officials, mostly residents of large towns,[9] tended to support the same compromises and diversions.

The city and its villages put aid to business first; the country emphasized reform. Reform propagandists, although depending on urban headquarters, leadership, press, and "angels," frankly stated and repeatedly showed by their itineraries and tactics that their strongest support came from the rural districts.[10] The third party vote was heavier there. The ultimate logic of the new Hamiltonians and that of the reformers clashed at every point: the positive or the minimum state, economic centralization or diffusion, social stratification or equality, collectivism or individualism, standardization or diversity, conformity to law and order or libertarian nonconformity, and a secularized, conservative religion or radical Protestantism. Men in history, however, have never followed ideas to their logical conclusions—neither the idealizations of the communitarians in the forties nor the subsequent utopia of the benevolent paternalists. As opinions consciously held, the differences were slight, for rural Vermonters had long since accepted the view that what was good for business—roads, for instance—was good for them. Indeed, only where urban-dependent business grew, in and near railroad towns, was there prosperity in late nineteenth century Vermont, and even that was precarious. But the source of the ferment that spoiled the cider for the farmer or wage-earner and led them toward "ultraism" in a period of rural instability, was the subconscious fear of regimentation by urban industrialism.[11] The reformers generally displaced their aggressions, either attacking minor local irritants or distant wrongs. The local urban agents either tried to stay neutral, as did the leading newspapers during the Maine Law fever and the nativist flurry, or bargained to help the anti-Masons and moderate antislavery men against others. Their main job was to make piecemeal progress in harmony with accepted habits. They recognized that Vermonters are willing to be hired to help, but not to take orders from bosses.

Reform movements tended to be satisfied with forms while business won the substance. Anti-Masonry captured the state for Wirt in 1832, and suppressed the Masons for a dozen years, but you should have seen the one that got away: the village aristocracy went on to establish the upper house in 1837 and take firm control of "The Star That Never Sets," the Whig Party. In the decade after 1845, the Masons, Odd Fellows, college fraternities, Sons of Temperance, and Know Nothings were all active, secret orders.

Temperance was an exception as a cause which by "moral suasion" had substantially reduced drinking by 1840, so that rum was no longer a staple import to the general store; stills decayed, and liquor no longer was a prequisite of harvest hands. Prohibition was also another kind of exception: although a majority of nineteen towns opposed the Maine Law in 1853, the large towns rolled up a decisive dry majority in the referendum, with some evidence of employer pressure for sober workmen. Rural resentment that year gave the state the only Democratic governor it has ever had. Henceforth, alcoholic drinks were unavailable by statute, except from the town liquor agency (sole dispenser for mechanical, medicinal, and chemical purposes only), the stores (dispensers of the same under patent-medicine labels), the groceries (dispensers of "Maine Law beer"), the physicians (illegally except through the agent), and the surreptitious sellers, including the taverns.

The victories of the nativists were even

[9] My tabulation of principal Vermont officials, 1840–80, shows that 75–100 per cent of twelve classes, and 50–75 per cent of six classes, were residents of towns over 2,500, which comprised from 14–27 per cent of the population. Of the sheriffs, lieutenant governors, and state senators, 31–39 per cent were large town residents; 9 per cent of the 240-odd town representatives.

[10] "Let me into your districts among the honest and industrious farmers. These are the men that feel for the oppressed and that will save the country from slavery," wrote the Reverend J. Gleed in the Montpelier *Green Mountain Freeman*, April 20, 1844. See also reports of Alanson St. Clair, *ibid.*, March 9, June 14, 1844. "A narrow and detestable *agrarian* spirit actuated many of the councils of the K. N.'s," said the editorial of W. P. Davis, former member, in the St. Albans *Messenger*, August 16, 1855.

[11] See Norman Ware, *The Industrial Worker, 1840–1860; the Reaction of American Industrial Society to the Advance of the Industrial Revolution* (Boston, 1924), viii–xxi.

emptier than those of the prohibitionists, except as anti-Irish sentiment served as a binder for the Republican Party. Few industrialists, editors, or lawyers not at odds with the Whig or Republican machine joined them. Although led by villagers, the rank and file were rural Yankees, alarmed at the Irish invasion. The movement insured in the surviving Democratic party a hard core of antagonized Roman Catholic Irish. Perhaps Protestant success in keeping the Bible in the schools was a delayed nativist victory, for the Roman Catholics chose to support parochial schools, protest, and trust to their birth rate. After the 1855 election, the Republican party swallowed the "one-idea" men, including many ex-Democrats. The reformers were paid off with one governorship[12]—their last high office before the twentieth century.

Before facing the big question—is there an urban-rural aspect to the unique Republicanism of Vermont?—let us see how far Vermonters were being educated to accept "urbanities." What goals were set? What skills taught? What parts of tradition transmitted? How was public opinion modified? Vermonters were already won to the major purpose of getting ahead in this world, wherever it might take them. Many, however, with a variety of vested interests at home, wanted to check emigration by teaching the practical skills necessary to tussle successfully with nature and enjoy it. The city, on the other hand, required of its future salesmen, clerks, bookkeepers, managers, and professionals the ability to communicate with strangers by symbols and abstractions. The issue was verbalization versus "learning by doing," a slogan that merely expressed the situation in the rural Vermont where John Dewey grew up.

Forty years of law making piled up a mass of statutes which permitted the large towns to introduce grade and high schools and expand plant, equipment, and staff for a compulsory growing enrollment. But centralization was more a hope than an achievement, and the farmers' passive resistance to taxes and laws blocked school enforcement in the hills. The new normal schools (1866) were decentralized, and a state agricultural college, intended for practical education, was organized in 1865. Teachers left for better jobs elsewhere, but such education as the debt- and depression-plagued state decided to afford glamorized urban opportunities, and added a pull to the strong economic push that made farm boys leave home.

Popular education, covering a multitude of activities and reaching far more people, strongly imitated urban ways. The much read weekly, driven by metropolitan competition either to feature local news or buy boiler plate, always played a major role. The rural Sabbath further retreated as a few Sunday editions appeared and more weeklies chose Saturday publication for Sunday reading. The growth of interest in local history from the founding of the Vermont Historical Society in 1838 to the monuments of Miss Abby Hemenway—a five-volume co-operative enterprise—and Gilman's *Bibliography* betokened the nostalgia of a rural region that had seen better days.[13] The stone symbol of the backward look was the Bennington Battle monument, projected in 1853, revived by the centennial spirit, and dedicated in 1891. Antiquarianism and self-improvement expanded the holdings and circulation of farmers' and town libraries. The catalogue of lectures, readings, shows, and concerts—even genuine Italian opera and D'Oyley Carte—on the Vermont circuit would be as long as that of a town library and a city education in itself. Imitation, the sincerest flattery of the metropolis, characterized the balls, bustles, black walnut interiors, cast iron fountains, mansard roofs, and gingerbread. In the amusements of all classes, baseball replaced squirrel hunts, county fairs were more frankly for horse-racing, and the introduction of the high-wheeled bicycle, gymnasium equipment, and player pianos heralded the age of mechanical pastimes. Many a silent piano and lithograph in the parlor signified aspirations for urban status. A new emphasis on speed and breaking records, a wider range for mixed company, and a touch of provincial inferiority complex symbolized Vermont's position on the urban periphery.

This adjacency provided a new source of income and contact—the tourist business. In another place this theme could well be developed as a rural impact on city folks, for the flight from the metropolis began almost as soon as there was one to escape from. Of

[12] Ryland Fletcher (1799–1885), nativist, radical abolitionist, prohibitionist, Baptist of Cavendish, governor 1856–58.

[13] Abby Maria Hemenway, *Vermont Historical Gazetteer* (5 vols., Burlington, 1868–91); Marcus D. Gilman, *The Bibliography of Vermont* (Burlington, 1897), first published in the Montpelier *Argus and Patriot*, 1879–80. Local historians are still preoccupied with pioneer days.

course for a generation before 1850, the lake steamer leg of the New York-Montreal run had been a "must" for every grand tourist. In the late thirties and forties, half a dozen summer hotels at medicinal springs took the cue from Saratoga, but in the decade after 1845 the leading Vermont spa was Wesselhoeft's Brattleboro water cure. The Brattleboro postmaster started using the first adhesive stamps in 1845 when the Wesselhoeft opened. Patients and boarders came from every large city from Montreal to New Orleans. Disagreements and prosperity started a second sanatorium during the peak years of 1853–56. "There they stand," wrote Samuel Bowles of the Springfield *Republican*, at the height of the 1854 season,

> two comfortable-looking piles of boards and shingles, bristling over and against each other on the same street, with their generous piazzas of a summer afternoon thick with babies, pretty women and pale men, casting jealous glances back and forth; for there is considerable rivalry between the 'establishments,' which ramifies through both households, and juts out over the beauty of their respective babies and the loveliness of their doctors . . . . [You don't have to be sick to patronize the 'douches,' 'plunges,' and 'waves.'] The village is very gay from such an irruption from the cities, and the 'establishments' expend part of their rivalry in attractive dances, theatricals, tableaux . . . .[14]

These upper-class urban representatives brought the gospel of bathing, bedroom ventilation, and water drinking, and a great deal more cultural baggage was imported via resorts after the water cure fad died out. Even the 1845 and the 1861 reports of state geological surveys turned aside from the scientific and economic consideration of stone and mineral to boost the "scenological" glories of Vermont.[15]

Many large new town hotels, decorated in the best fake style of the period, were also a fertile source of urban-rural contact. One should not forget those four-year residence hotels called colleges and such fashionable prep schools as the Vermont Episcopal Institute and the Burnside Military School of Brattleboro. Hotel transients displayed the clothes, the cash, and the culture which natives envied and secretly vowed to acquire. The landlords earnestly sought to satisfy their tastes and merit their approval. They smarted if aspersions were cast upon smoking and temperance rules, uncomfortable beds, gauche service, or unfashionable appointments. They and their fellow tradesmen took the lead in tempering the rustic and unprofitable habits of more backward citizens and in drawing them into the urban orbit.

No doubt Vermonters laughed at the way city folks out-gushed the brooks over mere scenery, and raved against the profanation of the landscape by advertisements for Kendall's Spavin Cure and Paine's Celery Compound. They agreed with Silas Lapham that a smooth piece of intervale, with half a dozen wineglass elms, was sightly; but what was so sacred about a big rock—an obstacle to the plow—that you couldn't put mineral paint on it in three colors?[16] Yet after the Civil War, the natives themselves took to camping on lakes or entertaining guests with a lake excursion or a mountain ride or hike, with dinner at the hotel on top. Meanwhile the number of year around and summer residents in their own houses and camps increased.

The steadiest political agent of urban penetration into Vermont has been its rural Republican Party. The antislavery movement, which had won almost the entire population to its principles by the mid-forties, provided the free-soil basis for the Republican coalition, which included Whigs in the saddle, anti-Nebraska Democrats, Temperance men, and Know Nothings. An explanation of its long-term success can come only from a study of its victories for a hundred years, but its grip was established in the first generation. In the first place, the national party rapidly achieved the aims of both rural and urban elements in the coalition: Union, abolition, and aid to business. Some have found the sources of Vermont conservatism in the loss of the best crusader material—young men—as war casualties and as emigrants, or in the psycho'·g-ical exhaustion after intoxication with the slavery issue. The temporary Civil War boom for farmers did probably give the sons the

[14] Quoted in Brattleboro *Eagle*, August 11, 1854. The amateur theatricals, alternating with concerts and Jarley's wax works, essayed both Shakespeare and farces.

[15] C. B. Adams, *Annual Report on the Geology of the State of Vermont* (Burlington, 1845), 59; Edward Hitchcock, *Geology of Vermont: Descriptive . . . Theoretical, Economical and Scenological* (2 vols., Claremont, New Hampshire, 1861); Josiah Barnes, *The Green Mountain Traveler* (New York, 1861; two editions of 1855 and 1859 with varying titles). Railroads continued this publicity along with the brochures of particular resorts, until the state government took over the function.

[16] William D. Howells, *The Rise of Silas Lapham* (Boston, c. 1884), 18.

cash to leave on, and the comparatively few war sacrifices for reform may have dampened crusading zeal far out of proportion to their number. Yet for seventy years Vermont has been "a good place to be from," as one of Senator Robert Taft's ancestors said and Stephen Douglas repeated, while "isms" throve and parties multiplied in spite or even because of emigration. Americans, especially of Puritan background, are perpetual reformers, with powers of recuperation after each single spurt, no matter how frenzied, in a single cause. The war itself created new problems which elsewhere evoked new radicalism.

No vigorous movement for reform had more than a faint echo in Vermont because in its position on the urban frontier it accepted unawares the accelerated course in big business psychology which the Civil War experience provided. The conduct of the war was the biggest business yet known to Americans. It taught both command and obedience, the intricacies of government aid, the advantages of standardization and secularization, the regimentation of machinery, the possibilities of force and fraud, and how to get ahead by all these means.

The Union victory was accomplished in the name of tradition by *Vermont* and other state *volunteers*, formally state administered, under the impetus of the most popular wave of patriotic enthusiasm they had ever experienced. Only about 12,000 out of a population of 315,000 were in active service at any one time but the fiction of total war was at the root of the propaganda, and overt opposition was minuscule. Most natives felt that they were giving what service they could, and thus came under the influence of the collectivist war machine. Differences between participants were minimized; their conflicts were settled by discussing and bargaining; and the whole process was overlaid with traditional voluntarism, individualism, and state independence of action.

After the war the Democratic opposition was a harmless 30 per cent, led by conservatives in fundamental agreement with the Republicans. The newest rural and village Vermonters, the French Canadians, preferred the Republicans to the Irish Democrats of the large towns. A tiny rural reformist opposition repeated the shibboleths of Western and Southern agrarians, but these did not seem to fit Vermont conditions. Here was no unseen ogre capitalist, but rather a Proctor in Marble, a Fairbanks in scales, an Estey in organs, a Smith in railroading — benevolent *native* feudal barons. Their home-owned, home-managed companies, and a few others, had alone made industrialism work well to their advantage in Vermont. Vestigial Calvinism confirmed the economic fact that many were called and few chosen. The prominent few obscured the silent penetration of "foreign," *i.e.*, urban capital and influence in their own companies and elsewhere. Many local managers still lived near the works and were known for their personal aid to the less fortunate and for their donations to civic enterprises. So successfully had the leaders in the large towns interpreted the new forces in terms of the Vermont tradition that the rural districts, still holding constitutional power in the lower house and populous enough to elect every state senator, were willing to delegate this power to the Republican party for the sake of its history and its industrial promises. Not until the New Deal did the Democrats, more by birth rate than any defection from inherited political habits, again assume a threatening position.

By 1880, rural Vermont had taken to heart the message of the nineteenth century to the urban periphery; improve transportation and industrialize, find a new specialty, leave, or suffer. Many areas of poorly endowed hill country were suffering abandonment or stagnation, to be revived later by use of the gasoline or electric motor and by the recreation business. The valleys, now boasting two small cities, had capitulated to the technological and urban impacts, and collected their pay in profits and problems. Yankees, French Canadians, and Irish, bolstered by only a shriveled culture, whether Roman or Puritan, and worn from wrestling with the starved soils of Ireland, Quebec, and Vermont, had traveled a great social and psychological distance since turnpike days. They had given up reform as either already accomplished or ridiculous. They could not recognize the equally utopian answer of benevolent paternalism as a hand-to-mouth, penny-wise solution for them, satisfactory only to the successful few, but inadequate in the face of prolonged rural depression. They overlooked the need for articulated planning inherent in urban industrialism, and held more closely their faith in mobile individualism, conceived in capitalism, nurtured on the frontier and on the decaying farm, and now confirmed by the very conditions of city growth at their doorstep.

THE AMERICAN CIVIL WAR: AN INCENTIVE TO WESTERN INDIA'S EXPERIMENTS WITH FOREIGN COTTON SEEDS?[1]

FRENISE A. LOGAN

Agricultural and Technical College of North Carolina at Greensboro

During the American Civil War, the immense cotton production of the South was disrupted. Increased cotton cultivation was undertaken in nearly every country where the plant would grow. India, Brazil, Egypt, the West Indies, and China were the chief exporters. English manufacturers, however, looked to India as the one great hope not only to relieve the immediate distress but also to relieve permanently their dependence upon the South as the principal source of supply. But it was clear in India in 1861 that the quality of Indian cotton had to be improved before it could satisfy the British demand. The *Deccan Herald* noted shortly after the outbreak of war in America: "The first thing to be done is to ensure the article to be of equal quality with that furnished by American merchants; this being done . . . we think that India will become a formidable rival to the American trade . . . ."[2]

The Court of Directors of the East India Company from 1788 on had attempted, with little or no success, to introduce a seed which would furnish a better stapled cotton so as to give India a fair chance against the American cotton in the English market.[3] Thus, in view of the successive failures, when the Crown assumed control of Indian affairs in 1858, veteran British civil servants as well as newspapers in India repeatedly urged the government of India not to undertake any more experiments with foreign seed.[4] The Revenue Commissioner of the Northern Division wrote to the Bombay government in 1860 that although the cotton experiments conducted in his area in 1858 and 1859 had been moderately successful, the utility of such experiments appeared to him to be extremely doubtful. He also declared that his intimate acquaintance with the history of the costly but unsuccessful efforts in Belgaum, Khandesh, Surat, Broach, and Ahmedabad Collectorates between 1830 and 1855, in which not one new fact bearing on the improvement of the cultivation of cotton had been discovered, as well as the 1858–1859 failures, convinced him that further experiments were futile. He urged the Bombay government not to waste any more money or effort to introduce foreign cotton into India.[5]

[1] The writer gathered the material for this article in the course of a year's study and research in India in 1953–54. He wishes to express his gratitude to the Ford Foundation Board on Overseas Training and Research for the financial support which made this study possible. That Foundation, however, is not to be understood as approving by virtue of its grant any of the statements or views expressed herein.

[2] *Deccan Herald* (Poona), May 20, 1861.

[3] See *Report of the Bombay Chamber of Commerce*, 1859–1860, xxvii–xxix. For the period 1847–1857, see the very valuable and voluminous collection entitled "Papers Showing the Measures taken since 1847 to Promote the Cultivation of Cotton in India," Part III, Bombay, housed in the Secretariat Library, Bombay City.

[4] Although the decision of the Bombay government to close all cotton experiment establishments was announced in a memorandum and then a resolution on March 10 and 27, 1860 respectively, the Bombay Chamber of Commerce on April 10 raised the question of the feasibility of Bombay government informing collectors in the cotton growing districts that since it still viewed "the question with interest" it would sanction the expense. The Chamber pointed out that inasmuch as it would be several years before private enterprise could assume direction of the experiments in the interior, "these small experiments, while of trifling cost to the Government," might result in indicating those districts which were suitable to the cultivation of foreign cotton. This proposal was rejected by the Bombay government on the grounds that it was unwise to give "discretional power" to its officers to expend money in making experiments. H. Brooke, Secretary, Bombay Chamber of Commerce, to H. Young, Chief Secretary, Government of Bombay, April 10, 1860; J. H. Rose and S. Mansfield, Revenue Commissioners, Southern and Northern Divisions, to B. H. Ellis, Secretary, Government of Bombay, June 27, May 8, 1860 respectively. *Correspondence Relating to Cotton Cultivation in India* (1863), 370, 372, 374. Hereinafter cited as CRCCI with appropriate accompanying data.

[5] S. Mansfield to B. H. Ellis, May 8, 1860, Secretariat Record Office, Revenue Department. Henceforth, references to the material housed in the Sec-

J. N. Rose, the Revenue Commissioner of the Southern Division, took a stand equally as adamant:

> There can hardly I think be a question as to the inexpediency of government taking part in the Culture of Cotton. Past experiences and the losses government have already sustained by them, sufficiently indicate this, and I am clearly of the opinion that the Ryots should be left to cultivate Cotton or not upon their lands, as they may find it to their advantage or otherwise.[6]

Although Rose would not hazard an estimate of the cost of the cotton experiments conducted by the government between 1830 and 1860, one newspaper declared that the sum "thus literally thrown away" could not have been less than thirty lakhs or three million rupees; consequently it hoped that the Bombay government would profit from past experiences, "and not risk again burning its fingers with any more Cotton Experiments."[7]

But it was also clear in 1860 that improvement of the Indian staple was absolutely necessary if India was to compete successfully with or replace the United States as a cotton producer.[8] Accordingly, when the Bombay government decided to discontinue all experiments for improving the growth of cotton which involved the cultivation of land under the direct supervision of government officers, the Bombay Chamber of Commerce expressed the hope that private individuals and companies would continue the experiment.[9]

This hope was partially answered by the Cotton Supply Association, an organization founded in England in 1857 by British cotton interests. In June 1862, the India Office in London, at the request of the Association, sent the Bombay government 250 copies of a circular on the requisites for the improvement of Indian cotton and urged that it be given wide circulation, both in English and in a translated form, among the Indian cultivators in the cotton districts of the Presidency.[10] The preamble stressed the fact that the Cotton Supply Association did not doubt that Indian could "produce Cotton in unlimited abundance and a quality suited to the requirements of at least three fourths of the manufacturing interests of Great Britain." Nonetheless, the Association felt it necessary to point out to the ryots of India that comparative shortness of fibre was one of the chief factors which hindered Indian cotton from competing successfully with the American staple "and securing a commanding position in the English market." In order to remedy this imperfection, the Cotton Supply Association urged, among other things, the use of superior foreign seed. The Bombay government received the circulars on July 24, 1862 and, during the course of the next three weeks, sent English and translated copies to each of the chief cotton growing districts.[11]

In spite of these and other exertions on the part of the Cotton Supply Association, the Bombay Chamber of Commerce, and the friendly cooperation of the Bombay government, a small but vocal minority in the English parliament accused Western India of failing to measure up to its cotton producing capabilities, particularly in regard to improvement of quality of the staple.[12] Accordingly, the government of India permitted the government of Bombay on August 14, 1863 to appoint G. F. Forbes as Cotton Commissioner for that Presidency.[13] Forbes was authorized to devote his full attention to problems related to the improvement and extension of the cultivation of cotton, and to the invention and manufacture of cotton cleaning machinery.[14] In making this move, the government of Bombay felt that published justification was necessary. In a long resolution that accompanied the letter of appointment, the Bombay government cited the failure of private capital as

---

retariat Record Office, Revenue Department, will be cited as SRORD with accompanying appropriate data.

[6] Rose to Ellis, June 27, 1860, SRORD.

[7] *Deccan Herald* (Poona), February 4, 1862. See also Alexander Burn, "On Cotton Culture in India from Foreign Seed," *Journal of the Agricultural and Horticultural Society in India*, 13:133 (January 1863–December 1864).

[8] See for example the *Bombay Saturday Review*, August 3, 1861; *Times of India* (Bombay City), February 6, 1862.

[9] *Report of the Bombay Chamber of Commerce*, 1860–1861, xxxi.

[10] The India Office, London, to the Governor of Bombay in Council, June 9, 1862, SRORD.

[11] J. B. Piele, Under Secretary, Government of Bombay, to the Collectors of Khandesh, Surat, Kaira, Ahmedabad, Poona, Ahmednuggur, Sholapoor, Belgaum, Dhawar, Sattara, Karachi, Shikapoor, and Hyderabad, Sind, July 31, 1862, SRORD.

[12] *Hansard's*, Third Series, 167:411.

[13] W. Grey, Secretary, Government of India, Calcutta, to Messrs. Mosley and Hurst, July 2, 1861, CRCCI, 57; Resolution of the Home Department, February 28, 1861.

[14] A. D. Robertson to H. Brooke, August 14, 1863, *Report of the Bombay Chamber of Commerce*, 1862–1863, p. 67.

the chief reason for such "an unprecedented" step.

> Government would much have preferred to have left the task of improving and extending the Cotton Supply to private enterprise. Two years, however, have now elapsed since a crisis, such as was calculated to bring forward such enterprise had it been forthcoming, arose, but little, as far as Government are aware, has been done by private enterprise, either here or in other presidencies, in the way of improving either the staple of the Cotton, or the machinery for cleaning it.[15]

After pointing out that Forbes' employment should not discourage private efforts, the resolution added:

> It is a further argument against depending entirely on the slow operation of private enterprise and self-interest in this matter, that whatever can be done must be done speedily; opportunity now offers, which, if not at once taken advantage of, may not be again presented for years to come, if at all.[16]

In anticipation of critics, and in answer to those who so bitterly condemned the earlier experiments with foreign seed, the resolution declared:

> The objection that 'trials have been made and failed' if seriously raised, cannot long be sustained. The experiments that have been made, if carefully analysed, are far from conclusive; and Government would not except from this judgment even the numerous and costly experiments conducted some years ago by the American planters.[17]

Thus, by 1863, the Bombay government had openly disavowed its earlier nonintervention policy and had commenced to subsidize cotton experiments. Therefore, it would be instructive to discuss at this point these experiments as they were carried out in Western India between 1861 and 1865, paying particular attention to experiments with American and Peruvian seed during this period.

American Seed. As early as 1793, the Court of Directors of the East India Company had forwarded to India American cotton seed with printed instructions for its cultivation. Experiments with the American seed continued spasmodically until 1840. In that year, the Court of Directors, apparently convinced that New Orleans seed could be successfully grown in India, invited twelve American cotton planters to India to instruct the Indian ryots in the cultivation of the American staple. These ambitious efforts failed to achieve any positive results except in the Dhawar districts and by 1844 were discontinued.[18] But efforts to extend the American variety in areas outside the Dhawar district persisted. In December 1858, the Cotton Supply Association sent the Bombay government twenty barrels of seed to be sold to the ryots by the Bombay Chamber of Commerce. The latter organization sent five barrels to Belgaum, Surat, Broach, and Ahmedabad respectively, with directions to the collectors to sell the seeds at moderate prices. The seed sent to the Belgaum district was refused by the ryots—even when it was offered free of charge.[19] The expected experiments in the four northern districts also failed. In Ahmedabad, the collector, instead of selling the seed to the ryots, had it sown under his own supervision, but the experiment appeared to have failed "for want of care upon the cultivation." In Surat, the seed was sold to the ryots, but the experiment failed because of too much rain. In Broach, the collector considered it useless even to attempt to persuade the Indian cultivators to give the seed a trial, because a short time before a wealthy Parsi merchant of Broach City had given several bags of New Orleans seed to the ryots. The venture had failed. The few ryots in Broach who had been induced to use the seed were forced to replant their fields with native seed.[20]

In the Dhawar district, the New Orleans seed had met and was continuing to meet with

[15] Resolution, Revenue Department, August 14, 1863, p. 71.
[16] *Ibid.*, 72.
[17] *Ibid.*

[18] M. L. Dantwala, *A Hundred Years of Indian Cotton* (Bombay, 1947), 5. Although the instructions were translated into the vernacular and distributed in Gujarat, the directions did not prove applicable to the ryots of that district. See *East India Company Reports*, 15–30, quoted in Walter R. Cassels, *Cotton, an Account of its Culture in the Bombay Presidency* (Bombay, 1862), 10, 31. For the work of the American planters sent to the Bombay Presidency, see *ibid.*, 44–58. See also letter from Forbes to Robertson, August 30, 1862, CRCCI, 475–477.

[19] G. B. Seton Karr, Collector of Belgaum, to J. D. Inverarity, Revenue Commissioner, Southern Division, June 2, 1859, SRORD.

[20] S. Mansfield to Secretary, Government of Bombay, April 30, 1860, SRORD. It is interesting to note that aside from the failure of the seed distributed by the Cotton Supply Association, the fifty-five "fresh bags" of New Orleans seed which the Bombay Chamber of Commerce had forwarded to the districts of Kaira, Ahmedabad, and Gujarat also failed as a result, it was alleged, of deterioration of the seed while en route to India from the United States. S. Mansfield to Government of Bombay, February 7, 1860, SRORD.

some success.[21] By 1861, American type cotton of Dhawar was so improved that H. Brooke, the Secretary of the Bombay Chamber of Commerce, enthusiastically wrote M. J. Shaw, Under Secretary to the government of Bombay, that it "now promises to compete on fair terms with the produce of the United States." According to Brooke, this rebirth of faith in the Dhawar American staple was most gratifying since in the 1850's it had so degenerated that its ability to compete with the American cotton in the English market was no better than native types. Through the persistent work of G. F. Forbes, the Superintendent of the gin factory at Dhawar, the chief difficulty —planting Dhawar American in the same field with the inferior indigenous variety— was removed.[22]

This and other improvements made by Forbes resulted in a clear superiority of this staple over the indigenous Indian cotton. Indeed, it was nearly equal to the value of middling New Orleans as is shown by the following price comparison for the years 1857–1861. All quotations are in English pence.[23]

	Middling Orleans	Fair Dhawar	Fair Broach	Fair Compta
1857	4½ pence	4¼ pence	3 pence	3¼ pence
1858	7 "	5 "	5 "	5 "
1859	7 "	5½ "	5½ "	5¼ "
1860	5 "	4¼ "	4½ "	3¼ "
1861	8½ "	7¼ "	6¼ "	5½ "

During the cotton season of 1864–65, Forbes distributed a total of 87,410 pounds from the acclimated seed of Dhawar.[24] The districts most extensively supplied were Mysore, Sind, the Punjab, and the Northwest Provinces, Berar, Gujarat, and Nagpore. Forbes believed that his efforts to introduce this cotton in the Northwest Provinces and the Punjab would be successful and that England would "yet be extensively supplied from those sources . . . with this valuable cotton."[25] But, if judged by the results in Gujarat during the 1865–66 season, this effort with Dhawar American acclimated seed proved as unsuccessful as the experiments with the pure New Orleans variety. Both the Revenue Commissioner of the Northern Division and the Bombay Chamber of Commerce attributed the failure in Gujarat to the excessive dry period which follows the withdrawal of the monsoon. Although this lack of moisture could have been counteracted by irrigation, the cost was viewed as too heavy pay.[26]

This 1865–66 failure in Gujarat only served to confirm earlier forecasts. As early as 1862, there were predictions that American cotton, either in its pure or acclimatized seed, could not be cultivated generally in India. It was pointed out that North American cotton positively would not thrive in a very dry climate since a certain amount of moisture in the atmosphere throughout the year was essential for its successful growth. Unlike the indigenous Indian varieties, the American variety could not withstand the months of drought which are characteristic of most parts of India. The one outstanding exception to this climatic condition was the Dhawar district, which retained a considerable quantity of moisture in the atmosphere throughout the dry season.[27]

Three years after the conclusion of the American Civil War, the newly appointed Governor of Bombay, William R. Fitzgerald, criticized the thoughtlessness of "certain individuals" in England who felt that if the American seed could be successfully grown in Dhawar, it could be cultivated equally as well in other parts of India.

> Great advantage has, no doubt, been obtained from the attention that has been paid to the growth of foreign cotton, and the cooperation of Cotton Supply Association which has facilitated the obtaining of the best seeds from different quarters;

[21] For a discussion of these experiments in the Dhawar district to 1860, see Cassels, *Cotton . . . Culture in Bombay Presidency*, 125–160.

[22] Brooke to Stewart, August 26, 1861, SRORD.

[23] *Ibid.*

[24] *Report on Cotton Seed Distribution*, 1864–1865, p. 1.

[25] Forbes to F. S. Chapman, Chief Secretary, Government of Bombay, July 7, 1865, SRORD.

[26] Revenue Commissioner, Northern Division, to Chapman, May 25, 1866, and James Taylor, Secretary, Bombay Chamber of Commerce, to Under Secretary, Government of Bombay, June 12, 1866, SRORD.

[27] Clement R. Markham, *Memorandum on the Indigenous Cotton Plant of the Coast Valleys of Peru and on the Proposed Introduction of its Cultivation into India*, 1, SRORD.

but the idea seems to me to have been too readily adopted at home [England] that the sole means of improving our cotton is to encourage the growth of the best known foreign varieties, and with this object to import and distribute every year large quantities of exotic seeds. Gentlemen interested in the supply of cotton at home have said to me that the simple duty of the Government is to introduce American cotton into India, as if it were likely, or possible, that the same kind of cotton would succeed in districts varying, as our cotton districts do, in every particular of climate, soil, elevation, or that the variety Dhawar American which can be successfully cultivated in the dry air of the Deccan will answer equally well in Guzerat, or on the coast of Kattywar.[28]

In 1869, Cotton Commissioner Forbes himself described as "crude and unreasonable" the belief that because the American plant yielded highly lucrative returns in the United States, it was suitable for every country in which cotton would grow. After years of effort, he was forced to admit that the general attempts to introduce the American seed into India were unsuccessful. He concluded:

My own experience, where I have had the opportunity on the spot of examining the results of experiments, only permits me to say that nowhere yet have I seen fibre produced at all equal to that of Dhawar, or even sufficiently good to encourage the introduction of this description of seed into other parts of India.[29]

Peruvian Seed. By 1863, it was recognized by many cotton men in India that the American plant was unable to stand the climate of most of India. The one exception, as we have noted, was the Dhawar district where rainfall, moisture, and climate were very similar to that in the cotton growing districts of the United States. Though experiments with the American variety continued, effort was directed towards introducing a cotton with long fibre which would thrive in a dry climate. In the spring of 1862, Clement R. Markham sent to the India Office in London. Copies of a memorandum proposing the introduction of the cotton plant of the dry coast valleys of Peru into Sind and certain districts in the Madras Presidency. Markham pointed out that the fibre of this Peruvian cotton, though shorter than Sea Island or Egyptian, was longer than that of New Orleans and Pernambuco, and much longer than any Indian varieties. The successful introduction of this Peruvian species would provide a long-stapled and high-priced cotton in the districts which had produced only the short-stapled indigenous Indian plant.[30]

The Indian Office was attracted to Markham's proposal. On August 14,. 1862, Sir Charles Wood informed the Governor of Bombay that he was sending him copies of the Markham memorandum. The Secretary of State for India also urged that the experiment be given a fair and exhaustive trial, especially in Sind.[31] The Bombay government received the letter and memorandum on September 12, and on September 29, J. B. Piele, Under Secretary in the Revenue Department, forwarded copies to the Commissioner in Sind.[32]

When the seed of the Peruvian plant arrived in Bombay early in December 1862, the Bombay government not only sent samples to Sind, but also the the collectors in Dhawar, Belgaum, Sholapoor, Khandesh, Surat, and Ahmedabad with instructions that as soon as the seeds ripened, the results were to be sent to the Revenue Department in Bombay City as well as to the Commissioners of the Southern and Northern Divisions.[33]

Since the climate of Sind was considered similar to that of Peru, great interest centered around the experiments carried out in that district. The first report was not encouraging. In October 1864, the Commissioner in Sind, S. Mansfield, declared that the experiments had been conducted so unsystematically that it was impossible to arrive at any decision as regards its failure or success, but he was inclined to believe that the Peruvian plant was adaptable to the Sind climate and soil.[34] The Bombay government accordingly instructed the Commissioner to continue the experiments. And notwithstanding another failure during the cotton season 1864–65, Mansfield would not admit that the Peruvian tests in Sind were a total failure.[35]

[28] "Minute" by the Governor of Bombay, January 10, 1868, as quoted in the *Administration Report of the Cotton Department*, 1868–1869, Appendix A.

[29] *Ibid.*, 18, 19.

[30] Markham, *Memorandum on the Indigenous Cotton Plant*, 1, 6. This tract dealt in great detail with the method of cultivating the plant of Peru, and the implementation of that method in India.

[31] Sir Charles Wood, Secretary of State for India, India Office, London, to Governor in Council, Bombay, August 14, 1862, SRORD.

[32] Piele to Commissioner in Sind, September 29, 1862, SRORD.

[33] A. D. Robertson to Collectors, December 19, 1862, SRORD.

[34] Mansfield to Sir B. E. Frere, Governor of Bombay, October 24, 1864, SRORD.

[35] Mansfield to Governor Frere, May 29, 1865, SRORD.

The results of the experiments carried out in the other districts of the Bombay Presidency were also unsatisfactory. The general conclusion reached in these areas was that since the Peruvian plant needed irrigation, and since any cotton which required irrigation could never become an important product in either division, all efforts to introduce it should be discontinued.[36] Perhaps the most pessimistic of these reports was that of G. Birdwood, Superintendent of the Agri-Horticultural Society of Bombay. Writing of the experiments he had conducted with the Peruvian plant, he said:

> As I have before remarked, and as every scientific cultivator must know, it is perfectly hopeless to grow cotton in the North and Southern Concons [Northern and Southern Divisions of the Bombay Presidency] of any of the known varieties in the hope [of competing] against American or other Indian growths.[37]

Despite these failures, Sir Charles Wood, the Secretary of State for India, asked that the experiments, particularly in Sind, be continued. "I regret to observe," he wrote, "that the experiment has hitherto been unsuccessful, but . . . the experiment cannot be regarded as final. You will inform me of the results of the further progress of this experiment."[38]

What were the factors contributing to the failure of these ambitious experiments with foreign cotton seed? The answer is not at all clear, but it appears that a combination of Englishmen "who knew little or nothing of agriculture," and the prejudice of the Indian ryots against foreign seed were contributory causes. As early as May 8, 1860, S. Mansfield, the Revenue Commissioner of the Northern Division, was urging the Bombay government to secure the services of a trained agriculturist to carry out the cotton experiments. He pointed out that the past failures of cotton experiments were "not to be wondered at, considering that the persons entrusted with the carrying out of them . . . knew little or nothing of agriculture either in theory or in practice." Mansfield further declared that any successful effort to improve the quality of Indian cotton would require the "lifetime and study" by Europeans well versed in agricultural sciences, rather than the fumbling attempts of "pensioned Servants and clerks whose only recommendation for the Superintendence of Cotton Experiments may be their good character for sobriety and honesty."[39]

As regards the Indian cultivator's prejudice against foreign seed, it had long been realized by the Bombay government that the ryots refused to plant any cotton which they believed was not adapted to the climate. If the foreign seed turned out unsuitable, the Indian cultivators would not only lose all their labor, but what was more important, they would lose the value of a crop they might have grown of indigenous cotton or any other produce which would have yielded a certain return.[40]

A mordant Englishman, in attempting to explain the failure of the cotton experiments conducted between 1861 and 1865, declared,

> Everything degenerates in India. The Anglo Saxon degenerates, cattle, horses, sheep, dogs and cats degenerate. The vegetable world follows the same inexorable law, and cotton forms no exception.[41]

[36] B. H. Ellis, Revenue Commissioner, Northern Division, July 23, 1864; W. Hart, Revenue Commissioner, Southern Division, August 2, 1864; G. Birdwood, Agri-Horticultural Society, Bombay, May 12, 1865, to A. D. Robertson, Secretary, Government of Bombay, SRORD.

[37] Birdwood to Government of Bombay, May 12, 1865, SRORD.

[38] Wood to Frere, September 30, 1865, SRORD.

[39] Mansfield to Ellis, May 8, 1860. Significantly, it was not until 1866 that the combined pleadings of the Government of Bombay and G. F. Forbes, the Cotton Commissioner, forced the Secretary of State for India, Sir Charles Wood, to employ a "practical gardener" to assist Forbes in improving the growth and cultivation of cotton by selection of seed. Wood to Government of Bombay, May 9, 1866, SRORD.

[40] Mansfield to Fawcett, December 21, 1858, SRORD.

[41] Thomas I. Pritchard, *The Administration of India, 1859–1868* (2 vols., London, 1869), 1:91.

A COLONIAL POEM ON INDIGO CULTURE

Annotated by HENNIG COHEN

University of South Carolina

That didactic agricultural poetry should attain a considerable degree of popularity during the so-called neoclassic period of English literature is not surprising, for this genre had firm roots in the writings of Hesiod and Virgil. John Dyer's *The Fleece* (London, 1757), which had as its subject sheep raising and the woolen industry, is perhaps the best known example. Virtually unknown to agricultural and literary historians is a colonial American poem of the same type of which lengthy fragments survive in files of the *South Carolina Gazette*, a weekly newspaper published in Charleston from 1732 until the Revolutionary War.

The *South Carolina Gazette* was established by Benjamin Franklin in partnership with an English printer, Thomas Whitmarsh.[1] When Whitmarsh died after editing the newspaper for almost two years, Franklin sent Lewis Timothy, a Huguenot refugee from Holland, to Charleston as his successor. The paper remained in the hands of the Timothy family—subsequently Lewis' wife and later his son, Peter—throughout the rest of its existence. From its beginning it had a decidedly literary flavor. Whitmarsh and the Timothys made repeated and successful appeals for poetry and essays by local authors to enliven sheets which otherwise would have contained little more than advertisements, official proclamations, and stale borrowings from British journals. As a result the *South Carolina Gazette* is a storehouse of materials of considerable importance to the study of the origins of American literature. This body of colonial writing of uneven quality reveals at once the impact of the British literary tradition. Almost every type of poetry which enjoyed a vogue in England had its counterpart in the *Gazette*. Corresponding to Dyer's *The Fleece* are extracts from a colonial poem on indigo culture, the first of which appeared in the gazette of August 25, 1757, accompanying "proposals" for the publication of "A Collection of POEMS, *on various SUBJECTS:* By a Resident of South-Carolina."

How important indigo culture was to the economy of colonial South Carolina at this time is obvious from an examination of the contents of the page which featured the proposals for publishing the "Collection of POEMS." This advertisement, with a heading set in display type followed by the specimen extract, occupied three fourths of the page. The other material on the page consisted of a list of runaway slaves "brought to the workhouse," "prices current in *Charles Town*" ("Best Indico, 20 to 30 *s*" per pound), exports from Charleston for the past nine months (754,218 pounds of indigo), and the advertisement of one Thomas Mellichamp of St. Andrews Parish who announced the discovery of "an Easy and Infallible Method of making INDICO *of the best Quality*" which in printed form could be purchased from the editor of the *Gazette*.[2] The single item which bore no direct relation to indigo was a brief notice from the editor that he would give employment to a *"sober Journeyman, that understands both Press and Case."*

Indigo had been planted successfully in South Carolina from the founding of the colony in 1670, but by 1700 it was neglected in favor of rice which had proved more profitable. Toward the middle of the 18th century

[1] For a history and description of the literary contents of this newspaper, see Hennig Cohen, *The South Carolina Gazette, 1732–1775* (Columbia, South Carolina, 1953). A unique and almost complete file of the *Gazette* is owned by the Charleston Library Society.

[2] This was not the only South Carolina imprint dealing with indigo. The *Gazette* of March 10, 1746, announced the publication of *Full and Useful Instructions and Observations concerning the Culture and Manufacturing of Indico*, a translation from the French of Capt. James de la Chapelle who was described as "a Person of great Experience in those Works at *St. Domingo*." Capt. de la Chapelle had advertised in the *Gazette* of November 11, 1745, that he would "teach any person who is inclined to made Indigo." Of related interest is the illustrated essay by "C. W." on the cultivation and curing of indigo published in the *Gentleman's Magazine* of May and June, 1755. "C. W." was Charles Woodmason, an indigo planter from the Port Royal vicinity who later became an Anglican divine.

an abrupt decline in the price of rice took place due to trade restrictions growing out of the European wars. A renewed interest in indigo resulted. In 1744 indigo seemed so promising that the South Carolina colonial legislature offered a bounty for its cultivation. Great Britain, which was importing some 600,000 pounds annually from the French West Indies, established a bounty of six pence a pound in 1747 which, reduced to four pence in 1765, remained in effect until the Revolution.[3]

The arrival of Moses Lindo, an indigo commission merchant from London, in 1756 further stimulated indigo production. An expert in curing and grading, Lindo was appointed "Surveyor and Inspector-General of Indico" and did much to improve the quality and marketing of this product. He died in 1774. Shortly thereafter the British bounty was withdrawn and the industry ceased to be important. Indigo continued to be raised in South Carolina on a small scale until it was supplanted by coal tar dyes.[4]

The "Collection of POEMS" was to consist of "*Six* Sheets, printed on a fine new Type." The price was set at two dollars. The book was to be "sewed in blue or marble paper" and printing was to begin "as soon as a sufficient Number of Subscriptions are obtained." Advance subscriptions could be had not only in Charleston where the book was sponsored by such substantial citizens as William Henderson, master of the free school, and Robert Wells, a learned bookseller, but also in the other principal communities of South Carolina, Georgetown and Port Royal, and in the neighboring colony of North Carolina. The specimen extract from "a Poem, *intituled* INDICO, *Being the* First *in the Collection*" followed the proposals. This extract, obviously taken from the beginning of the poem, is presented without change below:

The Means and Arts that to Perfection bring,
The richer Dye of INDICO, I sing.
Kind Heav'n! whose wise and providential Care
Has granted us another World to share,
These happy Climes to Antients quite unknown,
And fields more fruitful than *Britannia's* own;
Who for Man's Use has blest with Herbs the Soil,
Who crowns with Joy the wary Planter's Toil,
Do thou propitious grant the Help I need,
Success shall follow and my Labours speed.

IF Time permits, the Shady Forest clear,
And turn the Fallow for the following Year;
Beneath the noxious Pine the Soil is sour,
And spreading Oaks prevent the genial Pow'r
Of mellowing Suns; but yet, Experience shews,
In these hot climes that rich Herbage grows,
The following Summer, where in Winter past
The hungry Swine had found a Winter Mast.

Begin when first bleak Winter strips the Trees,
When Herds first shudder at the Northern Breeze,
'Tis time the Walnut and the Cypress tall
And tow'ring Pride of Verdant Pines to fall.
Arm'd with destructive Steel thy Negroes bring,
With Blows repeated let the Woodlands ring;
With winged Speed, the tim'rous Deer from far
Shall fly the Tumult of the Sylvan War,
When rattling Oaks and Pines promisc'ous bound,
And distant Groves re-eccho to the Sound.
Whilst the bright Flames shall seize the useless Log
For brush and trunks thy fertile Acres clog)
Then peaceful sleep — secure thy Herds shall be,
And live to feast thy Country Friends and thee.
When midnight Wolves, impell'd by Hunger's Pow'r,
With fiercest Rage the darken'd Forest scow'r,
Scar'd by the dreaded Flames, they'll turn away,
And hideous howl when baulk'd of whist for Prey.

[3] David Duncan Wallace, *The History of South Carolina* (4 vols., New York, 1934), 1:384–386.

[4] See the chapter on Moses Lindo in Barnett A. Elzas, *The Jews of South Carolina* (Philadelphia, 1905), 46–67.

Most skilful Planters in the Judgment rest,
That rotten Soil for INDICO's the best:
But let not that thy Hopes of Crops impair,
Some stiffer Soils great Droughts may better bear.
I've seen a Crop of Weed, like Thicket grown,
From stubborn Clay, on some Plantations mown.
Such Lands with double Exercise prepare,
And double Harvest shall reward thy Care.
Laborious Toil! — But all is Toil below,
Since Heav'n pronounc'd to mortal Man this Woe.
Immediate Want, or Dread of Future, can
With pow'rful Influence sway the Mind of Man.
Hence urging Poverty is justly stild
Mother of Arts, Invention's call'd her Child.
All hail, great Source of Industry! of Yore
A Goddess deem'd, when fam'd *Fabricius* bore
The Sway in *Rome*, and yet content to share
But one small Field, to plant his rural Fare.
Here from a State's tempestuous Troubles free,
Amidst the Sweets of honest Poverty,
In Freedom, Privacy, and calm Content,
He reap'd those Bounties Providence has sent:
She first inspir'd the *Mantuan* Bard, who sung
The Care of Flocks, and of their tender Young;
Who taught the lab'ring Hind to plough and sow,
The various Seasons of the Year to know,
To prune his Vines, to plant, to graft his Trees,
And reap the Labour of sagacious Bees.
Nor Rage of Seas, nor distant Worlds affright,
Nor native Soil, or Nature's Ties, our Flight
From them retard; if she her dire Commands
Impose on Man: She calls unnumber'd Bands
Of valiant Youth to War, she fires the Cold,
Spurs on the Drone, and makes the Coward bold.
All-conquering *Rome* to thee first owes her Birth,
How universal is thy Pow'r on Earth!
She peopled this new World, she still explores
Angola's Coast, and savage *Gambia's* Shores,
In Search of Slaves, a Race in Numbers great,
Whose Constitutions, temper'd to the Heat
By situation of their native Soil,
Best bear the scorching Suns, and rustic Toil:

But joyful Spring returns, the Winter's past,
The trees bud forth nor dread the Northern Blast,
Break off Delays, and thus prepare the Plain,
Let Two Feet void 'twixt every Trench remain.
Tho' some, imprudently, their Room confine,
Allowing half that Space to every Line.
Give Room, one Stem as much shall yield,
And richer far the Weed: So shall thy Field
With greater Ease from noxious Herbs be freed,
And knotty Grass that choaks the tender Weed.
So shall the Root by larger Banks be fed,
Nor fear the Rays from piercing Phœbus shed.
Cautious of this, in Lines direct and true
(For Order's best, and pleases best the View)
Extend thy long-stretch'd Furrows o'er the Plain
Then invocating Heav'n for speedy Rain
Sprinkle the Seed, &c.

The *Gazette* has no further mention of the indigo poem until December 1, 1758. In the issue of this date there appears the following communication addressed to Peter Timothy from a writer who signed himself "Agricola":

'TIS Observable that the Planters of *Carolina*, in the Months of *May*, *June*, and *July*, (when Farmers in *England* have more Leisure than any other Part of the Year), are then in the greatest Hurry; when without great Care and Labour in weeding their Crops, they would be entirely lost. This must be attributed to bad Husbandry, which the following Verses were intended to remedy.

They are an Extract of the Poem of INDICO, mentioned in your Gazette about *Twelve* Months ago; which can't be published 'till Subscriptions arrive from London, expected in the Spring, those here not amounting to the Expence of the Press.

I have found it beneficial to me to follow the Method prescribed by the Verses, and (with the Author's Leave) I send them to you, to be referred to the Judgement of my Brother-Planters, whether his Reasoning is not agreeable to Philosophy and good Husbandry.

"Agricola" then quotes a pertinent section from the indigo poem as follows:

YET Summer *Fallows best your Crops ensure,
And far exceed all Species of Manure.
By this the nitrous Particles of Air)
When loose the Surface, and the Passage)
fair,)
With Ease descend, and to the Soil Adhere.)
By this, malignant Vapours find a Vent,
And genial Salts by earthly Bodies pent,
When freed from Chains with which before th'are bound
Exert their Pow'r and spread their Virtues round.
Rich Emanations that from Phœbus flow
(The Life and Soul of all the Plants that grow),
Search latent Parts, correct the Humours sow'r,
And raise, and fix the vegative Pow'r.
How much less Toil would then our Planter have?
How much Expence in weeding might they save?
If 'ere the Grass to Shed its Seed begun,
The Roots were turn'd, and parched in the Sun.
But more than all the †*Golden Weed* requires
Such Husbandry, for as it first aspires
To spread, and branch on sudden stops to grow,
And all its Force employs to root below.
Cautious of future Heat, for *Thirty* Days
It's uppward Growth, by rooting deep delays.
Mean Time the Weeds their baneful Summits rear,
And Fennel wild, and Crab-Grass domineer.

**Ploughing the Ground you intend to sow next Summer.*

†*Indico.*

On November 3, 1759, the *Gazette* stated that "The Poem on INDICO, for which subscriptions have been on foot for above *two* years, being in our hands, will be put to press as soon as possible." For some reason, however, publication seems never to have taken place, or if it did, copies are no longer known to exist.[5] Apparently, the anonymous indigo poem survives only in two fragments in the files of an obscure colonial newspaper.[6]

[5] This was not the only case of Peter Timothy's failure to publish a work of merit for lack of sufficient subscribers. James Adair's classic *History of the American Indians* was repeatedly "proposed" in the *Gazette* prior to its publication in London in 1775.

[6] James Grainger's *The Sugar-Cane* is an interesting parallel to the indigo poem in that its subject is another colonial product. It was written at St. Christopher about 1762 and published in London in 1764.

BOOK REVIEWS

George Mercer Papers Relating to the Ohio Company of Virginia. Compiled and edited by Lois Mulkearn. (Pittsburgh, University of Pittsburgh Press, 1954, xxxviii, 731 p., illustrations, annotations, bibliography, and index, $10.00).

The Ohio Company, whose official life extended from 1747 to 1771, sought to obtain from the Crown a half million acres of land west of the Allegheny Mountains and to open up trade with the Indians who lived there. In 1749, the Company did receive a grant of 200,000 acres of land, but succeeding events, both colonial and continental, combined to obstruct the plans of the Company: the French and Indian War, Treaty of Easton in 1758, Bouquet's Proclamation of 1761, Pontiac's uprising, Proclamation of 1763, the Walpole or Grand Ohio Company, and finally the American Revolution. All these trials and tribulations of the Company are set forth in the *George Mercer Papers*, a collection of documents used by Mercer in his attempt to obtain for the Company clear title to the land granted it by the Crown in 1749. Although this volume is not intended as a history of the Company, a simultaneous study of the documents and notes will in all likelihood give the most complete history of the Company to date.

The volume is divided into four parts: (1) George Mercer Papers in the Darlington Memorial Library; (2) a facsimile of *The Case of the Ohio Company*, the original of which is in the New York Historical Society; (3) a commentary on *The Case of the Ohio Company*, which contains explanations and background material on the documents which comprise the *Case;* and (4) annotations which give further background information and explanations on persons, places, documents, etc., mentioned in or relating to the original documents from which the *Case* was compiled.

Although *The Case of the Ohio Company* contains material which is not among the Mercer papers in the Darlington Library and adds value to the volume, its reproduction has caused a duplication of documents and has complicated the use of the volume. A number of the documents found in Part I are also contained in the *Case*. No doubt, this duplication will be welcomed by those who find the small print of the *Case* difficult, if not impossible, to read. Since superior figures denoting footnotes could not be affixed to the facsimile, the annotations for the *Case* are in commentary form. This has, therefore, necessitated separate notes for Parts 1 and 2 of the volume. Use of the volume would have been greatly facilitated if these notes could have been combined.

The commentary, annotations, and bibliography denote the fine editorial work that has gone into this volume, as well as Mrs. Mulkearn's thorough acquaintance with the literature of the colonial period of American history. Much of her explanatory material has been derived from contemporary sources: documents, letters, diaries, etc. It is a volume that every student of colonial history and history of westward expansion should have.

Phyllis R. Abbott, University of Wisconsin

American Agriculture: Its Structure and Place in the Economy. By RONALD L. MIGHELL. (Census Monograph Series, New York, John Wiley & Sons, Inc., 1955, xii, 187 p., maps, appendix, and tables).

This Census monograph is a useful aid to the student bewildered by the confusing plethora of tables and descriptive data compiled in what often seems to be a haphazard system administered by the Bureau of the Census. It covers a brief survey of past years, the position of agriculture in the entire economy, the size and structure of the entire commercial agricultural area, farm tenure and debt, social features, changes and structural strain, and other matters. The dot maps are the greatest weakness, meaning almost nothing where the dots run together in big blots, Delaware, for example, being shown with more chickens (p. 40) than the three little counties could hold if the chickens stood wing to wing, bill to tail, and three deep.

The discourse is sometimes enlightening and other times not. The statement (p. 129) that "By 1920, nearly all the land suitable for agriculture had been taken up and the land frontier was no more" is certainly more accurate than anything usually attributed to Turner. But the declaration (p. 122) that "The National Grange . . . has always preferred to endorse positions on issues rather than specific parties or candidates" ignores the Farmers' parties supported by Grangers in the 1870's. The references to the "agricultural ladder" (pp. 95–96 and 172) leave the dubious impression that the device, if it ever really existed, was more useful for climbing up than sliding down. The observation (p. 130) that "The land frontier was the Nation's safety valve . . . " is not only vague and meaningless, but it also shows the need of the author to survey the safety-valve literature of the past score of years.

The student, after using this volume for an introduction, will better himself by laying it aside and digging into the Census itself.

Fred A. Shannon, University of Illinois

Machines of Plenty—Pioneering in American Agriculture. By STEWART H. HOLBROOK. (New York, The Macmillan Company, 1955, 246 p., illustrations, bibliography, and index, $4.00).

The dramatic and dynamic story of farm mechanization in America is forcefully and effectively told by using the life and work of Jerome Increase Case as an exemplar. Without the incumbrances of preface, table of contents, chapter headings, or footnotes, the reader is plunged right into a story so interestingly unfolded that he is unlikely to lay it aside after once starting to read it.

Case, born in Williamstown, Oswego County, New York, in 1819, migrated to Rochester, Racine County, Wisconsin, in 1842 because "He had read in agricultural journals that Rochester was the center of a new and wonderful wheat country. He wanted to be in a wheat country because he meant to be a thresherman." Case, with "six ground hog threshers," machines of English design, brought by steamship from New York state to Chicago, sold five of his machines on a slow horse-drawn journey to Rochester, keeping the sixth for custom threshing as a source of income upon his arrival in Racine County, Wisconsin. There, with the assistance of Richard Ela, he proceeded to combine the merits of the "ground hog threshing machine" with the merits of Ela's fanning mill into a "combined thresher-separator." Success came in the building of the "Cherry Hill Wonder" and a demonstration of successful operation of the machine on the Henry Cady farm in 1844.

Unable to secure water power in Rochester, Case moved to Racine where he built a large factory and by 1848 advertised it as the Racine Threshing Works, J. I. Case, Proprietor. By 1863 he had taken in three partners and thereby created J. I. Case & Company. Early in the 1870's this partnership structure was abandoned and there emerged a corporate structure, the J. I. Case Threshing Machine Company. The corporation quickly marked "its new type of threshing machine, the Agitator," a machine largely the work of his faithful associate, W. W. Dingee. By 1923 the company was marketing a combine, and by 1924 had eliminated "Threshing Machine" from its corporate name in realistic recognition of the fact that the J. I. Case Company not only made threshing machines, but had become a "full-line" farm machinery manufacturer. A Yankee peddler who had seized upon Old Abe, Wisconsin's famous war eagle, as his company's trademark became the "Threshing Machine King of the World." Much of his success appears to have been due to his personal attention to the details of management, an ability to win the confidence of inventors and to recognize the merits in machines others had designed and then to persuade them to work with him, and an effective flair for advertising.

Holbrook not only reveals the threshing machine manufacturer but he also portrays Jerome I. Case, the man, owner of Jay-Eye-See "the second fastest trotting horse in the United States." If you would rather see a good horse race than any other kind of sporting event, then read pages 96 to 103 of *Machines of Plenty* yourself—this reviewer seeks only to tempt you, not to tell you the story.

Chapter 7 is devoted to a short account of Bonanza wheat farming in Dakota Territory, particularly the Red River Valley development in what is now North Dakota, and to a similar brief account of Dr. Hugh Glenn's wheat farming in the Sacramento Valley of California.

Chapter 12 reviews a bit of the history of the swindlers who once used to fleece unsuspecting farmers and farmers' wives—clearly a part of "pioneering in American Agriculture" although hardly a contribution to "Machines of Plenty."

Holbrook brings the story of the J. I. Case Company down to 1953 to its 110th Anniversary; and there closes his book with two most satisfying chapters, one a brief of the significant events in the evolution of agricultural technology since 1850, and a final philosophical chapter upon the impact of technological progress upon the life of the farmer and his family.

H. L. Walster, North Dakota Agricultural College, Fargo

Rehabilitation and Development of Agriculture, Forestry and Fisheries in South Korea. (Report Prepared for the United Nations Reconstruction Agency by a Mission Selected by the Food and Agriculture Organization of the United Nations, New York, Columbia University Press, 1954, $8.75).

Many have urged that South Korea be made a "showcase of democracy." This volume shows how difficult it would be to achieve that end.

Eleven experts made up this FAO/UNKRA mission. They worked under handicaps—too little time, war conditions, and lack of basic statistics. Nonetheless, they assembled much useful information.

Historians will want more background material than is here provided; we feel that those who plan the future should study the record and traditions. The misssion did, however, look into the last years of the Japanese occupation. No effort was made to tackle political questions. In other ways, the experts found the Japanese record good. Japan, they say, helped Korea by agricultural research, improvement of rice culture, and the like.

Since 1945 there has been trouble everywhere. Crop yields are down. Marketing has been difficult, inflation disastrous. Taxes have gone uncollected in the war years, and the forests and fisheries have suffered. Even with UN aid, it will be hard to build back to prewar levels. And when that is done, South Korea will still have Asia's tragic problem: too many people on too little arable land.

What can be done? One problem is the division of North and South Korea. This being a political matter, the UN experts sidestep it. Nor do these men look for large outside subsidies. They assume (and probably correctly) that South Korea will have an appreciable but not an enormous amount of outside aid.

The mission puts little faith in the magic words "land reform." The key problem is not landlordism, but the small size of the Korean farm. Tackling that problem, the experts propose research and experimentation pointing to new and improved crops and methods. They favor education and extension work, and a complete overhaul of the marketing system. They heavily emphasize the need for cooperatives, and favor national planning for the forests and fisheries.

Although they see obstacles, the experts are cautiously optimistic. They find Koreans "relatively receptive to new techniques and ideas," and willing to work hard. Thus South Korea may move ahead slowly. If she has peace.

There are many tables, and a few, but not enough, maps and charts. Surprisingly, there is no index.

Fred Harvey Harrington, University of Wisconsin

The Story of the FAO. By Gove Hambidge. (New York, Van Nostrand, 1955, xii, 303 p., $6.50).

The Story of the FAO is an account of an international agency launched to aid people who normally do not make the headlines and who, for the most part, are ignored by politicians and diplomats until they become subjects of abject poverty and pity. Chiefly the product of World War II, the work of the Food and Agriculture Organization was expanded after the fighting ceased to combat hunger and promote better health through a program of technical assistance. A war-weary generation would have a difficult time finding a more promising instrument than the FAO for the attainment of these goals.

Gove Hambidge, the author, an agricultural writer of long standing, is the North American Regional Representative of the FAO. As a result, his observations are those of an administrator who has been associated with technical advisors, government officials, research men, and professors from this country and foreign lands. "I have a feeling," he says, "that the kind of international teamwork described here is creating a new breed of explorers on the frontiers of social science, one tough-minded and patient enough to stand persistent frustration without giving up." Written in a semi-popular vein, the volume is intended for the schoolteacher, the newspaperman, the public-spirited citizen, and perhaps for the professor who might wish a good panoramic view of the subject before wading into deeper water. As a sort of editor, Hambidge has woven what probably was an overwhelming mass of material into an intelligent pattern.

The setting for *The Story of the FAO* is global and the time for the bulk of it is the post World War II era. The first two chapters, designed to attract and retain the attention of the reader, tell in human interest fashion the aims and the problems that face the agency. First there is the case of the Egyptian Abu Libda, a typical peasant with a large family, hemmed down by customs, traditions, and legal barriers, who farms in the valley of the Nile amidst poverty, squalor, "dust, dirt, sores," and flies, and who lives in a house filled with strong animal and manure smells. His plight, also that of the bulk of the villagers, is aggravated by the uneven distribution of land, and the fact that population is increasing faster than food production. Then there follows the case of Jim Barton who lives in northeast Iowa, in the valley of another of the world's greatest rivers, the Mississippi. Barton is portrayed as a model

small farmer who inherited his farm, raises corn, hogs, dairy cows, and chickens, and lives in a two-story, six-room house. Barton, far from being rich, produces almost all his food, fuel, most of his manure and timber, and makes a modest annual cash income. His family works as does Libda's, except that it is better equipped and employs modern methods. Before the gap between Libda and Barton can be narrowed, the Egyptian government will have to inaugurate reforms that will furnish the farmers additional resources, and new opportunities in the towns and cities for many who are now on the land.

The FAO was built on the ruins of the old League of Nations by a group of determined men who sought to expand the work in food, agriculture, housing, education, and child welfare. They were convinced that good health, agriculture, and nutrition were indivisible. If people needed food and the farmers wanted to produce all they could, why not harness the two drives? Programs of increased production and nutrition would enable governments to build sturdier populations, and perhaps solve the riddle of farm surpluses and low prices by making it possible for people to eat their way into better health and economic security. F. L. McDougall of Australia, one of the individuals identified with the food question in League days, brought the idea of an international approach to this problem to the attention of Eleanor Roosevelt who, in turn, communicated it to the President. At a White House luncheon, McDougall suggested to F. D. R. that the building of a United Nations, which at the time was close to the President's heart, might make food its first great concern. McDougall heard nothing more on the subject until he read about a conference on food and agriculture that the President had called to assemble in Hot Springs, Virginia, in May, 1943.

Students in international human relations will find the summary accounts of the technical assistance to nations in the Near East, Africa, the Far East, Europe, and Latin America of value. Briefly discussed are the kinds and amount of aid provided each country, the successes, the obstacles, and the problems involved. An appendix contains a wide variety of useful statistical data for various nations making possible comparative studies in food consumption, land resources, energy use, incomes, and mortality rates.

The shortcomings of this volume are in large measure inherent in the subject itself. It is too early to make an exhaustive study. Much more time will have to elapse, and then perhaps the task might well fall on the shoulders of some scholar who is both freed from administrative responsibilities and who can afford the luxury of criticism that is often denied the administrator. Attempting to tell the story of this agency on a global basis imposes its problems and leaves its impressions, and one of these is superficiality. Experiences worth telling would be those of the workers in the field, something about their backgrounds, and the reactions of the Abu Libdas toward them and the FAO. A study in the personnel recruiting practices and proficiencies of the FAO and the Marshall Aid programs might make an interesting study in contrasts.

These limitations should in no way obscure the redeeming qualities of a useful book. Hambidge has started to tell an important story to which many important chapters will be added, and he has helped this along with an excellent bibliography. Moreover, he points to an area which historians might well call to the attention of their graduate students. Certainly, such studies will make it possible for them to employ those language skills they sometimes acquire but seldom put to use, and help the members of the profession break down the walls of provincialism that threaten to entomb them.

Theodore Saloutos, University of California, Los Angeles

A Bibliography on South American Economic Affairs, Articles in Nineteenth-Century Periodicals. By Tom B. Jones, Elizabeth Anne Warburton, and Anne Kingsley. (Minneapolis, University of Minnesota Press, 1955, 146 p., $5.50).

This selective list has been badly needed and is very well done. Taken from 229 periodicals, the 6200 items rise by cross reference to a total of 9939 entries under agriculture, commerce, communications, finance, immigration, industry, labor, mining, and transportation. More than a thousand entries are listed in agriculture. Lack of an index is remedied by good arrangement: for each nation, entries are grouped under the nine headings listed above and are presented chronologically.

Only five Latin American periodicals were used, and the editors apologize by naming 34 others that are "Known to Contain Pertinent Material." Government periodicals are not used here, but are named in the Library of Congress series entitled *A Guide to the Official Publications of the Other American Republics.*

This is an important guide, a credit to its compilers and to those who subvened the work. This listing points to a wealth of useful information not yet "realized" by students of Latin America, as the compilers too tactfully remark.

Clifton B. Kroeber, University of Wisconsin

NEWS NOTES AND COMMENTS

AGRICULTURAL HISTORY REVIEW

The British Agricultural History Society issued two numbers of the *Agricultural History Review* during 1955. The second number contains the following, among other, articles: "Content and Sources of English Agrarian History after 1500," by Joan Thirsk; "The Curving Plow-strip and its Historical Implications," by S. R. Eyre; and "Crop Nutrition in Tudor and Early Stuart England," by G. E. Fussell.

Membership in the Society is open to all who are interested in the subject. The dues are one guinea per year, payable February 1. The Secretary, J. W. Y. Higgs, c/o Museum of English Rural Life, 7 Shinfield Road, Reading, England, will receive memberships or supply additional details. As an alternative and a matter of convenience, the Secretary-Treasurer of the Agricultural History Society will transmit dues and requests for membership to the British Society at the rate of $3.00 per year.

REPRINTS

The Agricultural History Society has available reprints of nearly all the articles in the 1955 issues of the journal at 25c per single copy, with additional copies at 5c each. Many reprints from earlier issues are available on the same terms. Send orders or requests for lists to the Secretary-Treasurer, Wayne D. Rasmussen, U. S. Agricultural Marketing Service, Washington 25, D. C.

COMMITTEE ON THE EDITORSHIP

The Committee on the Editorship suffered a grave loss with the unexpected death of its chairman, Herbert A. Kellar. It has been reorganized with the following membership: Rodney C. Loehr, University of Minnesota, chairman; Lewis Atherton, University of Missouri; and Bennett H. Wall, University of Kentucky. The editor and secretary-treasurer are ex-officio members of the committee.

ACTIVITIES OF MEMBERS

William D. Barns of West Virginia University is the author of "Record of Achievement: Historical Sketch of the Grange in West Virginia," in *The Farmer of West Virginia*, 2(9):11, 16, 21 (November, 1955).

James R. Case of Connecticut State College is the author of a 56-page pamphlet entitled *50 Early American Military Free Masons*.

Roger V. Clements of Manchester University is the author of "British Investment and American Legislative Restrictions in the Trans-Mississippi West, 1880–1900," *Mississippi Valley Historical Review*, 42:207–228 (September, 1955).

Fletcher M. Green of the University of North Carolina discusses "James S. Calhoun: Pioneer Georgia Leader and First Governor of New Mexico," in the *Georgia Historical Quarterly*, 39:309–347 (December, 1955).

Ben F. Rogers of Florida State University discusses "William Gates Le Duc, Commissioner of Agriculture," in *Minnesota History*, 34:287–295 (Autumn, 1955).

James H. Shideler of the University of California at Davis spent the fall of 1955 in Washington, D. C., doing research on agricultural policy in the National Archives, Library of Congress, and Department of Agriculture.

Mildred Throne of the State Historical Society of Iowa has edited "Civil War Letters of Abner Dunham, 12th Iowa Infantry," for *Iowa Journal of History*, 53:303–340 (October, 1955).

Among the people from the United States who attended the Ninth International Conference of Agricultural Economists, Otaniemi, Finland, August 19–28, 1955, were the following members of the Society: H. C. M. Case, University of Illinois; Sherman Johnson, U. S. Department of Agriculture; Philip M. Raup, University of Minnesota; and H. C. Taylor, Washington, D. C.

The June, 1955, issue of *Current History* was devoted to a historical survey of American farm leaders. The articles included: "Andrew Jackson and the Agrarian West," by Louis B. Schmidt; "George N. Peek: Equality for Agriculture," by Gilbert C. Fite; and "Edward A. O'Neal: The Farm Bureau and the New Deal," by Theodore Saloutos.

AMERICAN ECONOMIC ASSOCIATION

The American Economic Association, founded in 1885, is an organization with a membership of over seven thousand persons interested in the study of economics or the economic phases of social and political questions. Its purpose is the encouragement of perfect freedom of economic discussion. The Association as such takes no partisan attitude, nor will it commit its members to any position on practical economic questions.

The publications of the Association consist of the *American Economic Review*, a quarterly, the *Proceedings* of the annual meetings, a handbook or directory, and occasional monographs on special subjects. Yearly subscription to all publications is $6.00.

There are six classes of active membership: annual, $6.00; family (second member without *Review*), $1.00; junior (graduate students, for three years only), $3.00; subscribing, $10.00; contributing, $25.00; life, $100.00 in a single payment.

Send for information booklet and address inquiries concerning membership and subscription to:

James Washington Bell, *Secretary-Treasurer*,
American Economic Association,
Northwestern University,
Evanston, Illinois

MEMBERSHIP IN THE

MISSISSIPPI VALLEY HISTORICAL ASSOCIATION

may be had by making application to the Secretary and by payment of the annual dues provided by the Constitution. All members will receive the Review issued quarterly. Dues: Library membership, $5 annually; Sustaining membership, $5 annually; Life membership, $100 : : : : : :

Address: James C. Olson, *Secretary*

MISSISSIPPI VALLEY HISTORICAL ASSOCIATION
1500 R Street
LINCOLN 8, NEBRASKA

AGRICULTURAL HISTORY

The Agricultural History Society wants copies of *Agricultural History* that will otherwise be discarded. It will gladly pay return postage or express charges on any back numbers.

The back numbers of *Agricultural History* are in constant demand. Do not destroy any copies as someone always wants them.

AGRICULTURAL HISTORY SOCIETY
Room 3905, South Agriculture Building
U. S. Agricultural Marketing Service
Washington 25, D. C.

The Everett Eugene Edwards Awards in Agricultural History

The Agricultural History Society, in partial recognition of the outstanding services of Everett E. Edwards to the organization and in honor of his memory, has established the Everett Eugene Edwards Memorial Awards to be given to the authors of the two best articles (presidental addresses excluded) in *Agricultural History* each year. One prize of $50.00 is offered for the best manuscript submitted by an author who is in the course of taking a degree and one prize of $50.00 for the best published article by an author who is a more advanced scholar.

The Awards are financed from the Edwards Memorial Fund to which all members of the Society and other interested persons are invited to subscribe. However, the amounts necessary to pay the Awards for a period of ten years have been guaranteed by three of Edwards' former co-workers.

All articles to be considered for publication and other communications regarding editorial matters should be addressed to Vernon Carstensen, Editor, Department of Agricultural Economics, University of Wisconsin, Madison 6, Wisconsin. *Address inquiries regarding the* MEMORIAL FUND, MEMBERSHIP IN THE SOCIETY, *and business matters to* WAYNE D. RASMUSSEN, *Secretary-Treasurer*, U. S. Agricultural Marketing Service, Washington 25, D. C.